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PREFACE.

SINCE I published, in 1864, my latest edition of "How to Farm Profitably," I have continued my exertions in the cause of agricultural progress, and now submit a record of them to the public in a small additional volume.

If I am spared for some time longer, it is probable that I may publish a work on agriculture in a less disjointed and more orderly form.

J. J. M.

TIPTREE HALL, KELVEDON, ESSEX,
June, 1867.

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PROFITABLE FARMING.

SOME OF THE CAUSES THAT TEND TO RENDER FARMING UNPROFITABLE.

Read before the London Farmers' Club, Dec. 5, 1864.

IN accordance with the notice on our paper of business, I purpose this evening to point out and investigate some of the causes that tend to render farming unprofitable. I shall classify them under the heads of uncontrollable and controllable, apportioning the latter between landlords and tenants, according to ther responsibilities. In the tenants' department I shall consider the causes as affecting animal and vegetable management; also soil, climate, and manures. I need hardly say that it will be impossible to deal with so large a subject comprehensively within the time limited, but I will do my best to be brief and, if possible, clear. If the farmers of Great Britain generally knew as well how to produce a profitable result as most of the gentlemen I now see before me, I should have no occasion to read this paper; but, as I have said before, this Club represents the sunny side of agriculture, and that is but a small area compared with the shady recesses of mismanagement, misfortune, and loss. "Plenty of meat and manure" must be, for the future, the motto of successful agriculture. The want of this is a prominent cause of unsuccess in farming. Farmers must learn to sell their crops to their animals, rather than to the miller: even with an immediate loss of 15 per cent., there is a greater gain in so doing. If sending away the crops from the farm impoverishes it, keeping them at home must produce an opposite result; and therefore, if I want to know how a man *is getting on, I ask* him how many score pounds of meat *per acre he makes over* the whole area of his farm?—200 lbs.

per acre is my usual quantity. Apologizing for this digression, I will now proceed to consider "some of the causes that tend to render farming unprofitable." Here is a long list of them:—Not understanding the business of farming, especially the proper management of live stock; farming with insufficient capital, or taking too much land; extravagance in personal expenditure; not attending to your business; hiring your land without a lease; not stipulating for the power of selling or transferring that lease; hiring your land too dear; being let in with an over-valuation; not suiting your crops to the soil and climate; buying too dear; selling too cheap; robbing, and thus starving, your grass land; too many weeds, and too little hoeing; too shallow cultivation; too little manure; too little live stock; too little purchased food; too little purchased manures; too little good grass land; the absence of steam-power; fat horses and lazy ploughmen; the use of old-fashioned and improper implements; too many trees and fences; too small fields; bad roads and ill-placed homesteads; insufficient shelter for live stock, especially on heavy land; want of drainage on twenty millions of acres, according to Mr. Bailey Denton, one of our best authorities; being bound for an unsuccessful friend; too little experiment, and too much prejudice; not insuring against fire and hail-storms; family calamities; personal affliction; the seasons; murrain and blight; wind storm; incendiarism; inundation; local self-sufficiency, and want of general information and agricultural literature; difficulties in the transfer of land; want of agricultural statistics; a minimum crop causing a maximum percentage of expense; too much seed; absence of piece-work; non-application of chalk or lime to poor, ferruginous, stiff clays; not having a good agricultural library; selling your produce on credit to unsafe persons; wire-worm; slug; late sowing; being generally behind with your work; waste of manure; having a dishonest bailiff; having unskilled or incompetent labourers; neglecting the use of salt for animals and on the land; satisfaction with farming as it is; adulterated manures; adulterated oil-cakes; the want of selection and great care as to sowing the very best seed; the neglect of good parentage in live stock; breeding in-and-in with either live stock or poultry; being behindhand in tillage, sowing, and the general work of the farm; the state of our laws as regarding the transfer of land; the want of associated capital for the purposes of agricultural improvement; the want of a *desire on the part of* landowners to seek the aid of associated *capital; the want of* improved arterial drainage; the want of

water supply for summer irrigation. In this list are many unavoidable causes,—such as blight, murrain, and adverse seasons. We have an illustration of the latter this year, when tens of thousands of acres on which nearly £10 per acre have been expended in preparation for a root crop, have partially or totally failed, owing to the protracted drought, thus depriving the farmer of that money return in meat on which he reasonably calculated, throwing him almost entirely upon his corn crop, which can only be disposed of at a very low price. Then, again: a cold, wet season like 1861 deprived many a farmer of his year's profit, and in many cases trenched upon his capital. The furious gale that swept through parts of Scotland early in September, just at the period of harvesting, thrashed out the corn, and caused an immense amount of damage. Against these the farmer cannot insure, although he can against hail-storms. The recent marsh-land inundations ruined several farmers. To all these must often be added personal and family afflictions of various kinds. Our Royal Agricultural Benevolent Institution has brought to light already too many of the causes to which I have alluded; for, on perusing the 150 appeals for our support, losses by stock, bad seasons, and family affliction, figure prominently, to which are not unfrequently added loss of tenure without valuation or allowance for capital sunk in improvements. Slowness of return is also a natural cause of moderate profit. We sow our wheat, and wait eleven to eighteen months for its conversion into money; while a dealer in stock, with a good connection, will make his return and realize his profit daily or weekly, accumulating frequently money enough to purchase and occupy large farms. A dealer can thus readily obtain advances from his banker, or assistance from a friend, because the article in which he deals is tangible and readily transferable; while the trammelled farmer, who has necessarily invested capital in the improvement of the soil, cannot deposit his lease as security, for he has not (as we have in towns) the power to transfer or dispose of it; and in case of premature death or failure, his family may be deprived of the value of his investment in improvements. This is an anomalous and unbusiness-like state of things, and tends to diminish the value of land, and discourages the introduction of wealthy and independent tenants. I should like to know what would become of business in towns, if we could not dispose of our leases when it suited us to do so. I have written a long paper *in my book* on this subject. In considering the *shortcomings of landlords*, I deal with the question nationally,

and not individually. Landlords are like other men—naturally and properly anxious to preserve their own rights and privileges. Many of them, noble by birth and vast in estate, have taken an advanced view of the proper condition of British agriculture. They have emerged from and cast off old-fashioned feudal restrictions and restraints, and have ceased to look upon farmers either as churls or vassals, and have attracted, encouraged, and I may say created, on their estates men of high intelligence and considerable capital. They have granted leases, valuations, &c. in a business manner. The tumble-down and insufficient sheds and hovels of antiquated farming have been swept away, and replaced by substantial buildings adapted to a large increase of stock, machinery, &c.; and such a class of tenants have been properly thought worthy of residential improvement. The labourer has no longer been looked upon as an incumbrance to be foisted on an adjoining parish; but a sufficiency of well-constructed cottages, with pure water, and the necessary area of garden, give evidence of a humanity and an intelligence highly conducive to diminished poor-rates and increased morality and efficiency. But has this emergence from feudal trammels abstracted aught from the dignity, the influence, the respect, or the esteem felt for these worthy landlords? Certainly not, but the reverse. Such men prefer intelligent respect to clownish or ignorant servility. It is gratifying to find noble dukes and great landlords treating agriculture as a business, and not ashamed to avail themselves of associated capital, to improve their estates and increase their rentals. I know some of them who prefer letting the shooting to their tenants, at sixpence or more per acre, rather than to strangers. Such a system does away with the heartburnings of game-preserving, and in some cases attracts a superior class of tenants. But, unfortunately, the picture I have drawn does not apply generally, and there is abundant need of a more liberal and commercial system in letting land.

FARMING PROFITS.

I have reason to believe that each farmer looks at my remarks from his own point of view, according to the circumstances in which he is individually placed. For instance, those who hold deep, rich fertile soils, having attached to them an extensive area of fine old grass land or meadow, will *consider my estimate* of profit too low; while the struggling *occupier of cold,* hungry, ferruginous, undrained clays, or

other poor soils, who is losing his capital, or merely obtaining a scant and penurious livelihood, may think my estimate of profit much too high. High farmers who are doing their duty to themselves and to their country are apt to fancy that I am censuring them, which, of course, is not the case. In forming my opinion of British agriculture as a whole, I pass in review the entire territory of the United Kingdom, and, while doing so, am bound to accept the unpleasant truth that there is an enormous scope and necessity for agricultural progress and amendment. That amendment ought to commence with the owner of the land, whose duty and interest it is to foster progress, and afford opportunities for a better state of things. Very vague notions prevail among outsiders generally on the question of farming profit; I will therefore touch tenderly on this delicate but essential subject. Farming is known to be proverbially a slow way of making money, although a healthy, pleasant, and independent occupation—permanent in its character, and not affected by fashionable changes, for appetite is ever recurring, and must be provided for; therefore, so long as there is a population to be fed, so long must the land be cultivated—farmed. As many persons not conversant with agriculture take far too sanguine a view of agricultural profits, I will endeavour to set the matter as clearly as I can before them. When I had the honour to read before your Club a paper on "The Capital of Agriculture; its Application and Remuneration," I stated that, taking the 56,000,000 of available acres of good, bad, and middling land in the United Kingdom—including, of course, its grass land, which occupies one-half the area of the United Kingdom—I estimated the capital employed at £4 per acre, landlords' measure, and the annual profit on that capital at 10 per cent., besides a house and offices rent-free, which may be taken as an additional 1¼ per cent., so that the profit may be roughly calculated at 8s. per acre, and house-rent free. This would give for the United Kingdom a tenant's profit of about £25,000,000 annually. On well-cultivated arable farms employing £10 per acre capital, £1 per acre profit would be certainly a good average; and I know many very good farmers who consider £500 a year on a 500-acre farm a full remuneration, having their residence, stabling, &c., rent-free, and some trifling advantages of the farmyard. Unlike townspeople, they get their bread, pork, poultry, milk, and eggs first hand, *unadulterated*, and unburthened with intermediate *expenses and profits*; also their hay, corn, and straw for their *riding-horses*. *Vegetables* are also fresh and untaxed; ser-

vants' wages are always much lower than in towns; so that altogether their 10 per cent. is equal to a much larger profit in towns, where rent and other matters form a large charge. Where much money is realized in agriculture, it often begins in rigid economy, combined with very superior ability in hiring, buying, selling, and dealing, by great vigilance in the economy and superintendence of manual and horse labour, and a thorough knowledge of stock management. We have many notable instances of great wealth and position attained by those who once followed their own plough, sowed their own seed, fed their own stock, and so got "the fore horse by the head." In fact, sound practical agriculture is composed, like our good old city of London, of self-made men, who began at the lowest step of the ladder, and reached competence and independence by their own good qualities. So strong is the belief in the truth of this theory, that a respected practical friend of mine in Cambridgeshire said to me, "I never knew a young man succeed as a farmer who began with £10,000 capital." And on asking him why, "Well," he said, "his habits are usually too expensive for a beginner; he trusts too much to others, and is not sufficiently impressed with the necessity for personal supervision, vigilance, frugality, and general economy in the management of his farm." Gentlemen-farmers who employ a manager, who himself ranks as a farmer, naturally find a difficulty in obtaining a profit beyond their rent. Extensive practical farmers, who must have assistance, frequently employ working bailiffs, or overlookers, receiving only a moderate increase on the wages of a labourer. Farming profits depend so much upon odds and ends—I mean on the successful working of every part—that each should be well done to make a full and satisfactory result.

MISMANAGEMENT OF LIVE STOCK.

If a farmer is wrong in the management of his live stock, he must bid adieu to all hope of profit. With the very best management he is liable to serious losses, from causes beyond his control. This morning I received an application on behalf of a most respectable and esteemed farmer, for my presentation to Christ's Hospital, for his son, owing to his having lost £2,000 by his live stock. I attach so much importance to this subject, that I consider it should hold a first place in agricultural study and instruction. There are certain great *general preventive* principles that might be profitably acted *upon, although they* are now too often neglected; and in very

difficult cases, the veterinary should give his scientific and professional aid. But are our ordinary "horse doctors" creditable to British agriculture? In too many cases there is much room for improvement. Our Veterinary College has, indeed, been a great boon to agriculture, which owes a heavy debt of gratitude to Professor Simonds and other scientific veterinarians. I have written so much in my book upon this subject, and there is so little time here to treat upon the question, that I will dismiss it by saying that Alderman Mechi's once-poohpoohed notion about the chaffing and preparation of food are now becoming fashionable among practical agriculturists, who I hope will no longer compel their bullocks to drink, in the shape of 150 lbs. of frozen turnips, 13½ gallons of frozen water, with only 15 lbs. of dry but frozen matter. Let us afford to animals the very same opportunities for comfort that we, as human beings, find most agreeable and profitable, both in food and shelter. I have generally been very successful in avoiding losses by stock; but this year I lost some calves, merely by allowing them to eat their fill of rich-sewaged Italian rye-grass. Where they received only a moderate quantity of the same food, they did well. Possibly, if they had received salt on the field, they would not have suffered. Being convinced, by practical experience as well as by theory, that no farmer distant from a town can succeed well without plenty of live stock, that is, without producing plenty of meat and manure, I attach the utmost importance to the proper knowledge of stock management, either by yourself or your stockman, or by both. I look upon this as a vital question as regards profit. As a proof of this, look at the causes of distress assigned by the 150 decayed farmers who are now candidates for relief from our Agricultural Benevolent Institution. In almost every case "losses by stock" are assigned as a prominent cause of failure. Within my own knowledge and neighbourhood I might quote numerous cases. Mr. —— lost all his farm horses by eating wheat from the barn floor, the doors having been imperfectly closed. Other live stock suffer from the same cause. This dry season no end of sheep have died from "shacking," or eating dry barley on the stubbles. There was not enough green succulent food to mix with it, and they were allowed to fill their stomachs with the bare barley, which swelled when moistened by drinking. Farmer So-and-So lost several cows by turning them out to feed *when the hoar frost* was on the leaves—icing their insides, *in fact*. *Want of* water has caused much loss by fever, &c.

Whole fields of wet and frozen turnips fail to increase the weight of sheep, but on the contrary cause immense losses by death, especially among ewes and lambs. Some very fine-cut straw, with a proportion of corn and cake, would prevent all this. So would shelter. When a bullock has consumed 150 lbs. of cold turnips in a day, you have obliged him to take into his stomach 13½ gallons of water, with only 15 lbs. of dry food.

FARM HORSES.

In the feeding of horses, and cattle too, I have often seen very great waste, I have said jocularly that ploughmen are more fond of their horses than their wives. They love to see them fat, and, as they have not to pay for their food, they will, if you do not control them, give it in superabundant wastefulness. How frequently the haystack is at the entire mercy of the horse-men! The dainty, over-fed horses pick out the choicest morsels, and tread the rest into manure. In my case, the hay is all cut into chaff, mixed with some straw-chaff, the oats and beans ground into meal, and the meal mixed with the cut chaff in the manger, the chaff being slightly sprinkled with water, to cause the meal to adhere to it, and to prevent the horses throwing out the chaff to get at the meal. When it is considered that in ordinary farming one-fourth, or at all events one-fifth, of the whole farm (landlords' measure) is required to feed the farm horses, in the ordinary way of turning them out, the question of diminishing this great charge is a most important one. If the loss of farm horses by mismanagement could be statistically ascertained, it would form a sum of astounding magnitude, and show a great deduction from the farmer's profits. Take, what is too often a common practice, as an example of mismanagement:—horses in a state of perspiration after hard work are ridden into a cold horsepond, or allowed to drink heartily of cold water before they begin to feed: results—farcy, gripes, inflammation, &c. The London brewers' horses drink when they please; but then a steam-tube passes through the tank, and the water is always warm. We know what is the probable effect upon ourselves of drinking cold water when our bodies are overheated. Fat horses are, like fat men, unable to do a hard day's work. Plenty of muscle and condition, with good exercise and wind, pay better. It is observable *that a farmer's nag horse* is rarely turned out, and yet he *looks glossy and well-conditioned.* Why this difference of

treatment? Again, a farmer seldom goes to market on four wheels. Why does he use waggons? I pronounce them, from unmistakable evidence, to be a cause of loss to him. If he will have the waggon, let it be on *two* wheels. If your stockman does not understand his business, your profit is endangered. If a man is deficient in quickness of observation and comparison, he will not do for stock. You cannot give them to one who does not naturally possess them.

VENTILATION.

Farmer —— always had illness among his horses when stalled. Now he turns them out into the yard they are healthy. The cause is obvious; the stable had no ventilation, consequently the putrescent atmosphere produced farcy and other diseases, much as it does with human beings huddled together in small close rooms. A few 9- or 12-inch pipes inserted through the brickwork near the ceiling, where there is a floor over it, or an opening in the ridge, and at the ends of the roof, will cause ventilation and circulation. The best test of a well-ventilated room or stable is to get in half a dozen cigar-smokers for an hour. If the ventilation is good, the smell will soon have passed away; if deficient in ventilation, the scent will long remain. I have a room with a door at each end; after a smoking party no trace of our doings is perceptible the next morning, provided *both* doors are left open at night. If one only is left open, there is not proper ventilation, and the room is impure. Therefore, have several openings under the wall-plate, near the ceiling or the roof, both in your cattle-sheds and horse stables, and a couple of doors. In my cattle-sheds I have many openings under the wall-plate and on the ridge as ventilators. It is important that the hanging or dividing board should reach some distance below the side openings in the roof ventilator. In very cold weather, or during strong cold winds, some of the openings can be closed by straw bands, so as to regulate the temperature according to season. Cold air contains much more oxygen than hot air in a given space. I have known several unwholesome cottages and sleeping-rooms made healthy by the insertion near the ceiling of some small 2-inch draining-pipes. We all know how offensive even spacious bed-rooms smell if we enter them after enjoying the pure morning air.

THE NON-USE OF SALT FOR LIVE STOCK.

I hear of so many cases where, by the use of salt, disease and non-success in stock have been remedied, that I consider its absence as very prejudicial. I have always had rock-salt in the mangers: common salt will do as well. Large losses in sheep often occur when being fed on rape or coleworts, especially after frost. This may be prevented by sowing over the leaves, in early morning, about two or three quarts of common salt, according to the size of the fold. I learned this from a large flockmaster who had profited by the practice. Salt appears to prevent swelling or flatulence.

WIRE-WORM.

Nothing is more easy than to get rid of these pests, either by salting the land, or by the use of about 5 cwt. of rapecake per acre: little of both is good. I commend this especially to our light-land friends. I have always been a great user of salt, even on heavy land when drained, and especially on grass lands. From 2 to 6 cwt. per acre, according to lightness of soil, is a sufficient quantity. I have found salt and quicklime mixed together very beneficial, especially for potatoes. I always mix guano with about half its weight of salt. This answers well for cereal crops, especially wheat.

FIT LABOURERS WELL SUPERVISED.

The reverse of this causes much loss. The labour on an arable highly-manured farm, with a large quantity of stock and steam machinery, is probably, including bailiff and engineer, 45*s.* per acre. Mismanagement or neglect in this matter to the extent of 20 per cent. would cause a loss of 9*s.* per acre, or nearly half the farmer's profit. I prefer piecework where possible. The want of honest or active men on a farm is a sure source of loss. The want of forethought, method, and order, adds to this loss; so does the dishonesty of either bailiff or labourers. I have known instances of collusion between bailiff and dealers in regard to the purchase and sale of live stock. Honesty is no doubt the rule—roguery the exception; but the watchful eye of the master is always desirable.

FARMERS DO NOT TRUST ENOUGH TO SCIENCE.

Witness the disbelief in the value of rape and cotton cake for feeding. And again, they do not often enough refer to their chemists for opinion as to the quality of the cattle food, cake, and manures that they purchase. The question of a few shillings or a guinea paid to Messrs. Way or Voelcker for their opinion is trivial as compared with the advantage gained. Farmers are grossly imposed upon, and victimized in many ways.

SOIL AND CLIMATE.

Probably there is no cause more prolific of failure than attempts to violate the laws of nature. We should always be governed more or less by the nature of the soil and climate. Any farmer changing his occupation and his district must leave behind him local customs, and study attentively the practice of the new neighbourhood. How well this is illustrated by the statistical returns from Ireland, where its moist atmosphere and friable soil are availed of to produce potatoes and oats, and root and green crops, in the proportion of 4 and 8 to 1 as compared with wheat, which only figures for 277,000 acres out of nearly six millions of acres of arable land! A Scotch or Welsh farmer from among the hills must give up all hopes of growing turnips in the stiff clays and cereal climate of Essex, where he must depend upon mangel wurzel, which luxuriates in stiff soil near the sea and hot sunshine, and will produce nearly twice as much weight and better quality at no greater cost. Light-land farmers coming to the stiff clays must give up winter folding, and resign themselves to covered yards and mangel brought home, also to beans and tares. Nature indicates the right crops by her natural productions; where the wild carrot and the wild oat thrives, we know what we should grow. The wild mangel on the sea-shore tells us that salt is essential in the growth of that root. The quality of grasses grown on limestone and chalk teaches us that it is in vain to hope for such a production upon our poor stiff uncalcareous ferruginous clays, unless we chalk or lime them artificially. A piece of ground on my lawn grows wild chamomile superabundantly; and I have heard of a great pear-grower who always looked out for soil that naturally produced superior pears. We may change the nature of the soil *and the character* of its products by amalgamation. It is *well known about here* that on our heath-soils 50 tons an acre

of chalky clay from the valley will eradicate the former class of weeds, and do more good than manure.

DAMAGE BY GAME.

The influence of game upon the farmer's profits is a matter deserving our consideration. I presume that we are all agreed that it is highly desirable that our great and dignified landowners should have every proper inducement and encouragement as residential notabilities. We all feel proud of our landed aristocracy, and know their residential value. I am myself an old and ardent sportsman, and therefore can appreciate the zest such an amusement affords to those who love it. Pheasants and partridges I look upon as real farmers' friends, assuming, of course, that sufficient food is provided for them by the landowner. I speak practically on this matter, for 300 fowls have at all seasons, not excepting harvest time, the free range of my cornfields. The harm they do is trivial compared with the benefit they confer as destroyers of grub and insect. The question of ground game presents a different aspect: hares and rabbits, however well fed, have a strong affection for the first shoot that comes from the germinating seed of wheat in October or November. A hundred rabbits will clear off acres of these shoots in a single night: the consequence is, a deficient and blighted crop at harvest time. Hares take a wider range, and do less injury. I am convinced that the destruction of that first stem is most injurious to the crop; in fact, it cripples irrecoverably the parent stem of the future family. The damage to spring-sown corn is very much less, because at that period of the year there is a great variety of young sweet grasses. Heavily-stocked covers should always be surrounded by grass land; because, if highly farmed, which it ought to be, the loss is comparatively small, and may be made good by extra manuring. This cannot be done with wheat, which should never be sown adjoining a cover. We all know that game farms are let below the ordinary rent for land. One thing is quite certain, as affecting the profit, that the land immediately surrounding game covers should be manured much more heavily than any other part of the farm, especially if grain land. So much extra produce limits the area of damage.

THE SEWAGE QUESTION.

Probably there is no more extensive or insidious cause of *loss to agriculture* than the waste and non-utilization of our

excreta. In the paper I read to you on this subject, I estimated that to feed London alone the produce raised on six millions of acres was annually required, so that the produce of the whole area of the kingdom (sixty millions of acres) may be said to pass through the London sewers into the Thames in ten years. The agricultural mind can scarcely realize such a gigantic and suicidal throwing away of valuable property. Our metropolitan sanitarians must give up all hope of a pure stream while this goes on at Barking Creek. Already every inlet in the neighbourhood gives unmistakable evidence, by its black and fœtid banks of mud, of its proximity to the great sewer. Owing to the recent Parliamentary Committee evidence, the sewage question may be said to be now fairly solved, and reduced to the simple question of a pump to raise it, and a pipe to convey it to the farmer. Those who, like myself, remember the time when there was no gas and a very indifferent water supply, and now see that in almost every house and room in the metropolis a supply of light is obtained by turning on a tap, can easily foresee the time when each farmer will turn on the tap and supply himself with town sewage through his meter according to his requirements. Sewage, like gas, will pass from the impossible to the actual and practical result. Who is to do it is not yet determined. Baron Liebig has shown that all that is wanted to make the sewage perfect is a certain quantity of superphosphate of lime to replace the bones of the animals, fish, poultry, and game, the flesh of which we consume, but the bones do not go into the sewers. If the farmer's produce were returned to him after consumption, we should hear less complaints of costly manures and want of profit. Steam-power has rendered this practicable, for it was clearly proved before the recent House of Commons Committee on Sewage that 1,000 tons of sewage might be pumped to an elevation of 300 feet at a cost of only 13*s.* to 14*s.* I am pleased to see that the question of town sewage is now occupying the columns of our principal newspapers. Twenty-odd years ago, when I first pressed it upon public attention, I was snubbed as a "nasty fellow," and it required all my moral convictions to support me; but I am rewarded now by the prospect of a great public good.

MORE MEAT, MORE MANURE.

The great want in farming is more meat, more manure, *and more artificial* manures. I have been making up my

books to the 31st October, my usual period, and find that after paying for £660 of purchased food (£300 of which, as grain, was bought of myself at market prices), my live stock have left me £7 per acre for root and green crops. It would have been £9 per acre but for the loss of £70 by calves, which died owing to being allowed to help themselves to some rich luxuriant Italian rye-grass. The quantity of meat actually made on the whole farm (170 acres, landlord's measure) was 220 lbs. for each acre. I am convinced that the system of shelter and preparation of food, combined with a few acres of sewaged Italian rye-grass, is the key to true economy and profit.

BAD COTTON-CAKE.

Causes much loss in stock. The husk of cotton seed is black, and as hard and indigestible as the bark of a tree. Seed-crushers have found out that by keeping a considerable portion of this bark ground up with the kernel, a greater quantity of oil can be expressed; whereas, when the seed is decorticated, the outside skin or husk being screened from it, it coagulates or consolidates so much, that they cannot obtain so much oil. Therefore avoid buying dark or black hard cotton-cake; good green rape-cake is much to be preferred at the same price. Cotton-cake when good is brittle, friable, and of a bright-yellow colour. The quality of this hard husk is easily ascertained by chewing a small piece of the cake.

LITTLE FIELDS AND LARGE FENCES.

I met at Newmarket the other day a good practical farmer, who said, "Mr. Mechi, I have only one fence on my farm of 700 acres, and that is an outside one. Owing to what you have said and written, my landlord altered his mind, and gave me permission to get rid of my internal and unprofitable enclosures." How can a Devonshire farmer, with his 3- and 4-acre fields, compete with my 700-acre friend?—and look at the landlord's responsibilities in gates and posts!

ARTIFICIAL MANURES.

Starving or half-starving the land is one of the most certain and serious causes of unprofitable farming. Although I make *so much meat* and manure, and consume so much purchased *food, still I find it* profitable to have recourse to artificial *manures, especially the* best Peruvian guano and some salt.

I have tested this again this very season, and find that although my mangel land was so heavily dressed with rich shed cake and corn manure, still the addition of 3 to 4 cwt. of guano and some salt gave me a good profit over and above the payment for its cost. The same remark applies to wheat; by omitting to guano it at a cost of 30*s.*, I lost a quarter of wheat and some straw. One can hardly overrate the benefits conferred upon the farmer who applies to exhausted soils an ample supply of artificial manures. Rape and cotton-cake are excellent fertilizers. These remarks hold good for grass lands, which are too often sadly neglected and robbed. Many a farm might be converted from an unprofitable to a profitable condition by the use of artificial manures.

THE WANT OF SOUND MIDDLE-CLASS EDUCATION.

The establishment of middle-class colleges promises to effect a great good; a sound and suitable education is much needed among farmers in certain districts; agricultural literature and examinations should certainly form a prominent part of such education—and then we might expect to find in each farmery a small but useful library of agricultural books, containing the valuable experience and advice of good and clever men who are no longer with us. How rarely one sees such a library now! A score pounds so invested would form a profitable investment. The Royal Agricultural College and the Glass-Nevin Schools in Ireland have already been fruitful of result.

In conclusion, there is in perspective a grand future for British agriculture, not merely by the reclamation of waste land—for of that there is but little left,—but rather by intensifying our farming—by concentrating capital on a limited area. Taking out of view individual capability, which must ever vary, our general system will be based on commercial and manufacturing principles, looking rather to result than to cost. Education, intercourse, and intelligence, goaded by foreign competition, will cause our agriculture to emerge from its ancient customs and feudal restraints. Set free to act, the national character will exhibit in this—as in manufactures, commerce, and railways—a vigorous, I would say a gigantic, action; but all this can scarcely be effected without a remapping *of the country*. Our crooked ways and cramped and *wooded enclosures must* give place to rectilinear extension,

but not bare or untimbered enclosures. The feelings of enthusiastic lovers of old landscape will no doubt be somewhat outraged; but the pleasures of the eye must subserve the imperative demands of the British stomach, for if that is not duly and cheaply filled, suffering will produce discontent, and then will follow its usual numerous concomitant attendant evils. I am not of opinion that it is desirable to depend upon foreigners for our food any more than for our manufactures. If we have the means to produce all or most of it at home—and I know that we have, if we choose to apply them—then we should put our shoulders to the wheel, and resolve that the agricultural carriage shall move faster, and that we will set to work in earnest to remove the obstructions that impede its progress. Landowners should lead the way, supported by capitalists, and then the sturdy British yeoman will not be found wanting in the good work of cheap and abundant production.

THE PROPER QUANTITY OF SEED.

EXPERIMENT and experience have taught me that the fulness of a crop does not depend upon the quantity of seed sown, but on the quality and condition of the soil; and, in a more limited degree, on climate and the period of sowing. Every agriculturist should, as a question of profit to himself, try on a small scale comparative quantities of seed; and if this were done generally (which I am sure it is not), a vast aggregate saving would accrue to the country at large, and a proportionate gain to the farmer himself. We often hear complaints of losses by a thin crop, but never by a thick one, although the latter too often subtracts considerably from the farmer's profit. I related last year that a peck of seed wheat per acre, dibbled at intervals, one kernel in a hole, produced 58 bushels of heavy wheat per acre, and 2¾ tons of straw; in fact, the thickest and heaviest crop of corn and straw on my farm. It was seen at various periods of its growth by many agricultural and other visitors. During winter, a single stem only having appeared from each kernel, the land at a distance appeared as if unsown, and we were often asked why we had omitted to drill that particular portion of the field. In the spring each stem radiated its shoots horizontally, to the extent in some instances of 30 to 48 stems, and ultimately became the best crop on the farm, and,

which is often convenient in harvesting, about four days later than the thick-sown put in in October, at the same time as the rest of the field was drilled with 1 bushel per acre. In October last, rather late in the month, we repeated the experiment on a heavy-land clover lea, as last year. The ground was rough and hard, and very dry, and although a kernel was placed in each hole, only about one-half, or half a peck per acre, came up. Of course we anticipated a partial failure; but spring came, and each stem threw out horizontally a large number of shoots, so that now it is admitted by all who see it that it will exceed in produce the adjoining crop, drilled at 1 bushel per acre. It appears to be about four or five days later than the rest. I invite all who feel an interest in the matter to inspect this and my general crops in July, because, on public grounds, it is lamentable to waste so much food as we do in useless or injuriously thick sowing, and it teaches us that deeper cultivation, drainage, and unwashed manure have more influence on the crops and on the seasons (whether wet or dry) than most people imagine. In spite of drought, my crops promise abundantly. This is a good heavy-land season, and particularly favourable to the stiff cracking clays. Thin, hot soils, especially where shallow-ploughed, must suffer considerably. A week ago I was in company with some (good) practical farmers who astonished me by saying that, although only within forty miles of London, they continued to sow 7 bushels of oats and 4 bushels of barley per acre!!! As I only put in 6 pecks of barley and 2 bushels of oats per acre, I presume that the astonishment was mutual. Even at the present low prices, a self-taxation to the extent of some 7*s.* or 8*s.* per acre is surely worthy of consideration. I do not wonder at my friends finding gaps in their clover, caused by prematurely laid crops. According to Mr. Caird, the average increase of our corn crops is 8 for 1—one million quarters of seed to produce nine millions of corn! This is discreditable to us, for surely one good seed in properly cultivated soil cannot produce so little, if it be allowed sufficient space to develop its growth. Forty for one is nearer the increase on my farm.—*June* 27, 1865.

DRY WEATHER AND DEEP CULTIVATION.

How is it that in spite of the long-continued drought my wheat, beans, oats, barley, tares, and cabbage luxuriate? I attribute this mainly to deep drainage, deep cultivation, and unwashed manure; something is also due to the cold heavy clay; but even on my light lands the advantage is conspicuous. I have 17 acres of mangel also looking admirably. We are to-day blessed with a very copious rain, which will be of great value to the country. After drainage, I attach great importance to deep cultivation,—I do not mean bringing to the surface the unaërated and ill-conditioned subsoil, which is almost poisonous, but by breaking it up in the track of the first plough, with a common iron plough (minus the breast) drawn by four strong horses.

Take as an instance a heavy-land field of 7 acres, from which we have just cleared a strong crop of tares, supported by wheat; I manure this heavily with shed manure; then by the process of trench-ploughing, which I have described, the subsoil and upper soil get partially mixed, the manure falling in among the subsoil, where it is most wanted. I then harrow and roll the land, and now that rain has moistened it, shall plant it with strong cabbage plants out of my seed-bed. I thus never fail to have a strong crop of cabbage after tares —in fact, two most valuable green crops within the 12 or 13 months. I then guano, and get a strong crop of barley or oats.

The good effect of this deep cultivation is felt throughout the whole rotation of crops. If you follow and watch the under plough, you will see, boiling up as it were from below the ordinary ploughing, a host of roots of strong-growing weeds, which would only have been decapitated by ordinary ploughing, and would soon reappear in competition with the growing crop. In this deep double ploughing lies the secret of my comparative freedom from strong-rooted weeds, and consequently improved crops. By this means we get rid of couch grass. Experience has taught me the great value of a crop of cabbage, and the certainty of a good crop as compared with the uncertainty, in our dry climate, of a Swede crop. I have now a fine crop of cabbage planted out in March, which will be ready in harvest, when other green food is scarce.

We pulp all our cabbage, and then, mixed with chaff, &c.,

it is a forcing nutritive food. A few London or garden cabbage come earlier than the cow cabbage. People talk of the exhausting nature of cabbage, but I like exhausting crops that make use of the subsoil, and produce great quantity and good quality. The following corn crop will succeed well if properly manured. It is only where little or poor manure is used that these complaints are heard; with plenty of fat stock manure, and some artificials, there is no fear of exhaustion by any crop.

I have said in former papers that heavy-land farms are really good stock farms. They produce in the driest summer plenty of beans, clover, tares, and cabbage, all which, when cut up, are excellent food, and I never miss an abundant crop of mangel. But then, on such soils, there must be under-cover feeding for bullocks, and proper winter shelter for all stock. The system of turning out bullock stock, either in winter or summer, is a great mistake. This I can assert from long practical experience.

The interest on proper sheds, and the cost of bringing home and cutting up or pulping, is quite overbalanced by the more rapid progress of the animal on a smaller quantity of food, and the superior quality of the shed-made cake manure, which we always cart direct from the shed to the land; thus avoiding dung-heaps and twice carting. This manure beats guano completely. With sheep out of doors in summer, we can manage well by folding, and cutting up where the food is long.

In heavy crops animals turned out have truly five mouths, reckoning four feet and the body as destroyers, if not consumers, of food; we certainly require great reform in this matter in our general agriculture. Referring again to the necessity for incorporating the manure with the subsoil, I am a decided believer in Liebig's theory that it is very difficult to get manure through the cultivated soil into the subsoil. The surface soil retains it, and consequently deep-rooted plants that seek their food in the subsoil fail to find it there. It is no doubt owing to the sagacious practice of that bright friend of agriculture, the Rev. Samuel Smith, who turns back the ploughed soil and incorporates the manure with the subsoil, that he grows such enormous and unfailing crops of roots.

Take a vertical section of our ordinary soils, and what do we see?—a few inches of dark upper ploughed soil, the under stratum being pale, dense, and showing no sign or colour of the manure or air having reached it. This proves what I

have stated, and urges upon us the propriety of both tilling and manuring the under or subsoil.

Yesterday's fine rains have done wonders for vegetation. My bailiff said to me, with reference to the heavy crop of tares and wheat grown before the cabbage, "This crop of green food, cut up into chaff, and given with cake, malt combs, &c., will pay more money than any wheat crop on the farm." And I believe he was right, seeing that we were selling our young fat lambs at 40*s.* each, or 1*s.* per lb., and mutton and beef in proportion.—*July*, 1865.

THE VALUE OF GUANO AND THE VALUE OF EXPERIMENTS.

How often has it been said to me, "Mr. Mechi, you are an experimentalist, and of course, as such, it cannot be expected that your farming should pay you; but we are much obliged by your losing money for our benefit, for you tell us of your failures."

This is very cold comfort for a man of business, and a very fallacious mode of reasoning, as I shall presently show. I consider no man to be a good and progressive farmer who does not experiment, for such a person is almost always enveloped in the meshes of old customs, old traditions, and strong prejudices.

How often have I spoken of thin seeding, and the reply has been, "It won't answer on our soil;" and when I mildly inquired for the comparative experiments that had brought him to such a conclusion, the reply has too often been, "No, I have not tried it, and I don't mean, for I know it won't answer on our soil: I like a thick plant and a thick crop."

But is it either expensive or difficult to make experiments in agriculture? Quite the reverse; a quarter or an eighth of an acre here and there will tell us a result as clearly as a whole farm. This has been my custom, and by such comparative experiments I have been enabled to deduce a practice suitable to my soil and climate, and agreeable in a pecuniary sense.

But now, as to the value of guano, for superphosphate rarely shows any good effect on our Essex clays—owing, I

presume, to our having already a sufficiency of bone earth in our soil.

I have been a user of guano for more than 20 years, and at a time when my practical friends ridiculed the idea of a "mere peppering" being able to rival the massive dung-heap. My general preparation for a mangel crop consists of about 20 to 25 loads of rich shed manure, 4 cwt. of Peruvian guano, and 2 cwt. of salt. It was thought that the guano might be partially superfluous after such a dressing of good manure; so to test it I omitted the guano on a certain portion, and the result was a loss of 5 tons of mangel per acre, which I could have sold at £1 per ton. But see what follows: this spring we as usual harrowed in (after the mangel) 1½ cwt. of guano and 1 cwt. of salt with 2 bushels of oats per acre (my usual quantity). To-day we have cut those oats, and on the portion not guanoed for mangel the previous year, there are at least 8 bushels less of oats, and a proportionate falling off in straw. It seems very probable from the appearance of the young clover that the effect of the guano will be traceable in that crop. Now when I am asked, "Ah, but, Mr. Mechi, does it pay?" I will reply, Here is an extra expenditure of £2. 14*s.* per acre, and I get in return for it £5 in mangel, £1. 5*s.* in oats, and so much in straw and clover. The fact is, we don't, as a rule, half manure or half cultivate; and although I make so very much rich shed manure, it is clear from the above and many similar experiments, that I must not dispense with guano as an auxiliary if I look for profitable results. "Well, but then, Mr. Mechi, where is all the money to come from to buy this expensive guano and keep so much more stock?"

I reply, Diminish the size of your holding; remember that it is the maximum crop that pays—the minimum keeps agriculture poor and humble.

Take the country through, and we find three-fourths of the land held too largely in proportion to the tenant's capital, and consequently unsatisfactory and unprofitable to the country at large, as well as to the occupiers.

With facts such as I have just quoted, and which I could greatly multiply, I must be excused for advocating a much higher and more intelligent practice in our general agriculture, and a greater emancipation from old customs no longer suitable to our altered and progressive condition.

Let us always remember, with a humiliated feeling, that the statistical agricultural map of Great Britian gives £4 per acre capital, and £3. 12*s.* per acre return or gross produce.

Can this be satisfactory, when we reflect that commercial and manufacturing energy and progress have caused an acre of land in Lombard Street to be worth more than £2,000,000 for its fee-simple? However highly I may manure for beans, I find it pays to put on for the wheat that follows 1 cwt. of guano and 1 cwt. of salt. The omission of this shows a great diminution in the crop. I always leave a small portion to test the difference. Why should not my brother farmers do the same?—*August* 3, 1865.

THICK SOWING, SHALLOW PLOUGHING, AND WEEDINESS.

Said a friend to me yesterday, "All the way from Rugby to London I saw several crops laid flat, the grass and weeds growing through them, and thistles as high as my stick. There cannot be a crop there, for the sheaves will be as light as feathers."

The experience of twenty years has taught me that thick sowing inflicts an enormous aggregate loss on British agriculture, and that loss is greatly aggravated by the ordinary shallow ploughing; for, as I have before said, the thistle and other strong and deep-rooted weeds, are merely decapitated by ordinary ploughing, and consequently our laid barley crops give unmistakable evidence that those weeds have still possession of the soil and subsoil. They stand towering above almost every barley crop, while in my own scarcely one can be found, owing to my second or under plough (drawn by four strong horses) having, when preparing for the root or cabbage crop, destroyed them by tearing them from their stronghold in the subsoil. As I pass through the country by train, I can judge where the ploughing has been shallow or deep by the appearance of the barley crops especially, and by the bean and wheat crops generally. The weediness of Great Britain costs the country millions annually. These weedy intruders take the lion's share of the food intended for our crops. But look at the difficulty of harvesting such crops, especially in a wet harvest-time as this is. These green weeds not only tend to delay the drying and carting, and heat the stack, but supply a stock of seeds for future crops. The sample is also frequently diminished in value some 2*s*. to 10*s*. per quarter, because these flat laid

weedy crops almost always turn out a bad, light sample. But why are these crops laid flat? Mind, I do not object to heavy crops whose weighty heads bow them down, and appear to be laid; but if you examine them, you will find, as mine are, that the stems are not horizontally flat, but that they are merely bowed or arched, leaving plenty of room for circulation of air under those arches, which never allow the heavy heads to come near the ground. They are, although laid, actually reposing on arches formed by the strong reedy stems of their neighbours. These stems, stiff, glassy, and reed-like, stand erect as stubble, and resist your steps when walking, very differently from the soft, spongy stubble of thick-sown crops. Mark the difference in growth of a thick and thin-sown crop when the warmed soil in spring stimulates vegetation. In one case, the crowded stems rush upward in a vertical struggle for light and air, which, being excluded from their stems in later growth, cause those stems to become spongy, soft, and deficient in that glassy covering which not only protects the circulation of the plant but keeps the stem erect. In consequence of overcrowding, down goes your crop prematurely, and up come your weeds, which have now lost the shade of their competitor the corn. Light frothy straw, and lean miserable kernels follow as a natural consequence, and are certain preludes to a low price and loss of profit.

But then say the advocates of thick-sowing, "But I like a thick crop at harvest." I reply, "So do I; but what is the true test of a thick crop?—not bulk, but weight, both of straw and corn. Experience has taught me that I always get a greater weight of both by thin sowing than from thick."

It is easy to understand why thick sowing has so strong a hold on the agricultural mind, and why it is no longer justifiable in practice. Before drills were invented, broadcasting was a necessity, and taking the variability in ploughing it is easy to understand that much seed being too deeply placed never came up, while much of it near the surface was food for birds. The farmers might well feel anxious about exact depth of furrow, and carefully laying them, as well as having a sower "cunning in his art." But drills and iron steel-toothed harrows have changed all this, and rendered a very much smaller quantity of seed absolutely necessary, for each seed in well-cultivated ground is by the drill placed in a proper position to grow; therefore let my old practical friends take the hint, and adapt themselves to an altered state of things. Even now I hear that many of our north-country

friends, over the Border and near it, cling to broadcasting, thus depriving themselves of the benefit of that labour-saving machine Garrett's horse-hoe, which takes 7 feet in width, and by which from 12 to 20 acres a day may be both cleansed and cultivated. Owing to the removal of trees and fences, drainage, and generally improved cultivation, our seeds are no longer subjected to such dangers as formerly. I cannot accept this excuse, "We sow thick to smother the weeds."

It is curious to trace how much accident has had to do with diminishing the quantity of seed. When the drill was first introduced, there was the desire to put in the same quantity of seed as when broadcasted, not considering how perfectly the drill placed every kernel, while by broadcasting much was wasted. An old friend in Warwickshire gave me an instance of this accidental diminution. When the new drill came, he ordered the man to take care to put in plenty of seed (their usual quantity being 3 bushels of wheat). The man saw so much seed coming down the pipes that he thought there must be a plenty. The field was of 20 acres, and when the master returned at midday, he found they had only put in 6 pecks. Great was the dismay and doubt whether it should not be resown.

However, the other half of the field was drilled with 3 bushels. At harvest the thin-sown beat the thick by more than a quarter per acre, and ever since 6 pecks has been the quantity of that neighbourhood.

Surely we ought not to wait for an accidental discovery when it is so easy and inexpensive to make comparative trials on a small portion of each field.

I have been led to make these remarks by my practical experience in thin sowing and deeply cultivating. It must be borne in mind that I allude to strong heavy land, well drained, and kept free from weeds, and properly manured, and in the cereal county of Essex. Let each man judge of his own soil and climate, and take into consideration all other circumstances. It would be impossible to lay down an inflexible rule for all soils and all climates; but at any rate I am satisfied that by moderate and careful experiments we shall all gradually arrive at a considerable diminution in the quantity of seed sown, especially as our agricultural practice approaches nearer to perfection.

As I have often said before, the quantity of corn produced does not mainly depend upon the quantity of seed sown; it is the natural or artificial fertility of the soil that causes the young plant to multiply its shoots or stems in spring.

The half-peck per acre of wheat on my 9-acre field is now cut and in shock, as well as the two lands of two sorts of wheat on each side of it sown with my usual quantity of four pecks. The half-peck appears, both in straw and grain, to have the advantage, but we shall test them carefully by weight and measure, both of corn and straw. This is a singular instance of an extreme case, because we gave it up for lost in the winter; but in the spring it branched out horizontally close to the ground, and then up rose vertically, after forming the curve of resistance below, from 10 to 28 strong reedy stems from each plant, each stem having a fine ear averaging 50 kernels, being an increase of from 500 to 1,400 for each kernel. This is somewhat different from the average of the kingdom—9 for 1, as described in Mr. James Caird's admirable book. My men estimate the general yield of the field at 52 bushels; if so, the increase for the half-peck will be 52 bushels, or 416 kernels for one.*

There certainly must be something radically wrong in our agriculture when we find 9 for 1 as a general average increase. In Russia, where there is no hoeing, and where weeds and wheat grow in company, the average increase is from 3½ to 5 for 1, according to the quality of the soil.

The question, as a national one, will be the better for a thorough agitation. There is something practically absurd in supposing that we can put in a screened kernel of wheat in properly prepared ground, and only obtain from it a quarter of an ear, or 10 kernels, and that it must only produce that one ear. I believe that the same principle holds good for wheat as for turnips, trees, or animals.

Put ten animals for nine months on a pasture which only contains food enough for one, the consequence would be death to most of them, and half starvation for the survivor. So it must be with plants: we know it is so with trees and turnips. The want of air and light, as well as other food, is destruction.

We never see two trees in close proximity without observing that they turn their backs to each other, and extend their arms in opposite directions; few or no branches are formed between them. It is not the want of earthy food that causes this, but the want of that aërial food without which neither plants nor animals can flourish.

Let my practical friends ponder on this important matter,

* It yielded 78 bushels per acre; the rest of the field yielded 56 bushels per acre.

and let them remember that whenever they wish to raise a new stock of corn, they carefully put one kernel in a hole, in well-cultivated ground, and rejoice in obtaining an enormous produce.

A good field of wheat should, in early spring, look as flat as if its stems were glued to the ground, every shoot pushing out horizontally before it takes its vertical movement.

Agriculturists admit that this is the proper appearance, but they can never obtain it by thick sowing and crowded plants, for then the early movement is an upward struggle for light and air (as we see in a crowded fir-plantation), and down they all go, too often prematurely, and ruinously, their spongy stems, rendered soft by the absence of light and air, being unable to sustain the impact of rains or wind.

I need scarcely say that a thin sower should select perfect seed—heavy as well as bulky—and freed by the blowing machine from all seed weeds, or light corn. This wet warm harvest, there will be an unusual quantity of sprouted grain, useless as seed. I have heard farmers say that, as a matter of economy, they sowed tail corn. This would never suit a thin sower, and it is certainly a very false economy. Last year one peck per acre produced the largest crop on my farm, both of corn and straw, viz., 58 bushels of wheat and $2\frac{3}{4}$ tons of straw per acre, accurately measured and weighed.

For careful experimental dibbling I am indebted to Mr. Hallett's simple dibble. It is like the point of an umbrella with its projecting collar that prevents the dibble-hole being made too large or too deep, and it does away with that injurious solidifying of the dibble-hole which causes it to hold water.

I cannot conclude this paper without expressing my admiration and esteem for those persevering pioneers in this good cause—I mean Mr. Hewitt Davis, the Rev. Samuel Smith, my friends the Rev. George Wilkins and the Venerable Archdeacon Huxtable,—may they long continue to be able to battle against inexperience and prejudice.—*August*, 1865.

IS LONG FALLOW NECESSARY?

I REPLY, certainly not, either on light or heavy lands, provided they are properly drained, deeply cultivated, and sufficiently manured. All the advantages of a long fallow

are gained by trench-ploughing and by horse and hand hoeing among our strong growing root, cabbage, and bean crops. There are certain crops that will always master the weeds if you will but use the hand and horse hoe. Weeds have no chance with a crop of tares and wheat, especially if you use guano; I mean tares sown with wheat early in October. The great destroyer of deep-rooted weeds is the second or trench plough, which tears them from their stronghold in the subsoil.

Beans, when an inch out of the ground, are already so deeply and strongly rooted that you may safely harrow the ground well with iron harrows. This is my practice; and although it appears a dangerous one, it answers admirably, and gets rid of the young or surface weeds, and stimulates the growth of the beans. Another strong deep-rooted plant is the mangel, which, although very young, has its roots deep in the soil, and will, if aided by the hand and horse hoe, very soon overcome its enemies the weeds.

If there are any weeds in red clover, the hand hoe in the spring, when the clover pushes its shoots, will decapitate its enemies, and then the clover takes care that they shall not again show ahead. Good farmers take care at the same period to have strong weeds mattocked out of their pastures. But then it may be said, How are we to get rid of our couch grass?

Couch grass loves water furrows and wet places; therefore drainage is indispensable. Next is deep cultivation by trench-ploughing. It is surprising how rapidly the surface furrow-slice will dry when it has another furrow-slice or cultivated land under it. After very heavy rain-storms the surface becomes almost immediately firm, the water having passed rapidly into the under cultivated layer. Couch grass is easily killed in our hot dry eastern counties during summer by double-ploughing and being harrowed to the surface and dried by the sun, or removed from the land; but bear in mind that if any moisture remains in the root, its vitality exists, and it will soon re-plant itself. My land is very free from couch grass; but wherever it appears it is forked out, shaken from the earth, and carried off the field.

If you plough your land before removing the couch grass, its divided parts are distributed by the drill, harrow, &c., and you thus get a multiplication of evil. I have now a fine growth of cabbages planted in July after tares. The couch grass shows itself in various patches. As soon as the land is dry enough, or immediately after harvest, every patch will

be forked out and carried off the land before we hoe the cabbage. The hoe would, if used before the fork, cut it and propagate it. Cabbages are quite able to keep down weeds after sufficient hoeing. One of our London or garden cabbage planted in March, and now used for feeding our stock, weighed 13 lb. Three tons of cabbage, according to analysis, contain as much flesh- (not fat-) forming matter as 20 tons of potatoes.

Long fallow is an apology for want of manure. Surely this is inadmissible, for we have guano and other artificial manures, if we cannot afford to produce our own by abundant meat-making. A year's fallow costs £5 at least, without any immediate return. £1 per acre spent in horse and hand hoeing among growing crops will give us ample cultivation after a trench-ploughing, and we get a valuable crop for consumption. Surely the days of long fallow are numbered: a proposition to fallow a fourth of our garden would create astonishment.

After harvest, and before scarifying the stubbles, we fork out every patch of couch grass and carry it off the land; an expense of 9*d.* per acre thus incurred is a profitable preventive.

If we could estimate or had statistics of the losses incurred by long fallows and by couch grass in the United Kingdom, it would astound us. I confess that I was astonished a few years ago to see, *en passant* by rail, huge stacks of couch grass, and to hear that a manufactory was established to convert it into paper. Several reflections passed through my mind at that moment which I may be excused for not committing to this paper.

I have a lively recollection of attending some years ago an agricultural trial of implements in the neighbourhood of Watford. The field, a stubble, was a pasture of couch grass. At the dinner that followed I ventured mildly to suggest that I thought the growing of couch grass was unprofitable, and that it was unfortunate to select such a field for a public exhibition of agricultural progress. A storm of indignation followed my remarks, and it really appeared to me from what was said that the field was not an unusual one. Since that time I have seen too many such fields in a similar state in various parts of the kingdom, and I observe with regret that in the reports of most of our trials of implements, comments are made on the unfavourable condition of the ground selected for trial.

I wish that my agricultural friends would dig down and see

how deep the roots of plants and weeds go—many feet deeper than some of them are aware of.—*Aug.*, 1865.

THE VALUE OF A TON OF STRAW.

"PEOPLE don't know the value of straw," said my ploughman to me to-day, and so careless are folks about it that I have considerable difficulty in preserving mine free from damaging rains.

Taking the country generally, straw is looked upon as only fit to spread about open farmyards to sop up the rains which have latterly been carrying away the farmer's profit in the shape of strong tea, leaving him only the tea-leaves. As straw can be thatched for 6*d.* a ton, it does appear to me a grievous neglect and waste of valuable property to allow it to stand unroofed, and become rotted by the weather. I produce on my farm of 170 acres about 200 tons of straw annually, and whether I realize 5*s.*, 10*s.*, 15*s.*, or 20*s.* a ton of it makes a considerable difference. I wish that our Agricultural Society would offer a prize for a correct and practical as well as scientific estimate of the value of straw of all kinds as food, as manure, or as litter. I am convinced, by my own practice, that straw (particularly bean, wheat, and oat) has a considerable value for feeding purposes, when rendered available as food. My labourers often say, "Ah, master, you could not keep half so much stock as you do if you did not consume your straw." Of course, near large towns, farmers will sell their straw and bring back manure. So important is straw considered as an article of animal food in Spain, that Messrs. Garrett are making machines, driven by steam power, for "straw pulping," so that it is rendered soft and silky—in fact, duly prepared for animal digestion.

I am assured that in all warm Eastern countries straw is always used as food for animals. 'Tis said "wise men come from the East," and in this case I am sure that our English farmers have something to learn.

Let us see what straw is composed of, and why it should be valuable as food, and especially as a substitute for hay, so as to set free for the growth of corn and roots a larger area.

The late Mr. Horsfall said in that excellent paper of his (the best, in my opinion, that ever was written), on Feeding Stock and Dairy Management (*Soc. Journ.*, vol. xviii. p. 173), "I am satisfied that the most economical use of food rich in

albuminous matter is together with straw or other materials which are deficient in this element." This I had proved to be true. He especially commends bean straw. He says, "In wheat straw, for which I pay 35*s.* per ton, I obtain for 1*s.* 2*d.* 32 lb. of starch (reduced as oil, 18½ lb. from 100 lb. of straw), available for the production of fat or for respiration." I have long since adopted straw as food, and should consider myself extremely foolish to waste it uselessly in an open and wet farmyard.

I believe that cabbage would have been much more extensively grown had farmers known how necessary it is to give with the cabbage a large quantity of straw chaff, without which much of the cabbage is wasted.—*Aug.*, 1865.

A WET HARVEST—HOW TO MITIGATE ITS EVILS.

I DO not venture to throw out any hints for the use of my old practical friends, who are supposed to know all about it; but there are many amateur farmers who, like myself, are seeking for and desirous to obtain information.

There are two sides to every question, and so it is with a wet harvest. The dark side on a stiff wet clay or tile-earth means (after 5 inches or 500 tons of water per acre in August) water through unthatched stacks, wet sheaves, speared or sprouted corn, spoiled straw, corn unfit for market, extra labour and waste, anxiety of mind, rivers overflowing, full ditches, land like birdlime, long fallows (where undrained), seas of mud, hoeing impossible, weeds rampant, land injured by deep ruts and deeper foot-holes in carting off the corn —a bad prospect for autumn scarifying and cultivation; labourers losing their time, and their wives and families almost losing their gleaning corn, the ears having grown and got washed into the soil; the strong and best of the farmyard tea washed away, roads deeply furrowed and injured by rushing torrents on inclined planes, the fly very busy, and maggots abundant in sheep; Bass, Allsopp, and our other friends who supply "thirsty souls," anxiously looking after old dry barley, naturally anticipating a short supply of malting quality, and some diminution in their profits—tantalizing fine Sundays and wet Mondays; spoiled second crop of hay. So much for the dark side: now for

the bright view—the bit of blue between the clouds. Five weeks ago the country was all drab, now it is "with verdure clad;" stock was then a drug for want of food, now it is at a good premium. When we consider that more than half the kingdom is in grass, one may realize the importance and profit of a natural irrigation of some 700 tons per acre of warm rain falling on a hot surface, and carrying down to the cold subsoil in drained lands an increased temperature. Turnips, mangel, rape, and especially cabbage, rejoice in the change, and promise to the meat-consumer greatly increased supplies as compared with the absence of root crops last year; allowing, however, a sufficient discount for the cattle plague. Taking all circumstances, on my own farm I consider the balance is an advantage in my favour, because I have got up my grain crops in fair order with very little loss, while my pasture, Italian rye-grass, mangel wurzel, and particularly cabbage (of all of which I have a considerable breadth), are immensely benefited and increased in produce by the rains. I also get a higher price than last year for my corn.

These remarks apply only to my own land and circumstances. Had I much summer fallow and few roots, the case would be entirely different. My observation of the crops this season leads me to the following conclusions:—That on stiff clays (like mine) that crack widely in dry weather, there is a very large crop of wheat. On my own land I have several fields yielding 7 to 8 quarters of wheat per acre, and I know of good yields in the neighbourhood. On such soils the heads are large, well set, and perfect. As a consequence, the weight being great, the sheaves did not blow down when strong winds came.

On chalky stiff clays that do not crack in dry weather, the crops of wheat are by no means equal to those of last year, and on light hot soils the crops are ruinously deficient. I will now state what I do to mitigate the evils of a wet harvest, remarking first that drained lands and open fields are much in my favour. I lay down as a principle that wheat cut with a bagging hook, or with a reaping-machine, or mowed with the scythe, will not, when sheaved and shocked, suffer much from rain, provided certain things are done. I had one field of rough chaff white, which stood a whole month after cutting, waiting in vain for three fine days to harden it fit for grinding, but we had no such chance, for during that period more than 5 inches or 500 tons of rain fell on each acre. So long as the mere outsides of the

sheaves were wet, we did nothing, but when 2 inches of rain or 200 tons per acre fell in 14 hours, and saturated the interior of the sheaves, we untied the bands, loosened and lifted the straw, turned it again at midday, rebound it, and carted it to stack. One fine day for such a purpose has an astonishing effect, prevents the grain from spearing or sprouting, and renders your crop safe. The cost of this useful and profitable operation is about 3*d.* to 4*d.* per quarter; removing the sheaves to fresh ground and turning them is useful, but nothing beats untying and separating. By this means time is saved, and opportunity availed of. The same remark applies to oats—of which I have also a good crop this year. These operations afford labour for the men at ordinary wages during the interrupted course of their harvest, and it is really of great importance to the farmer, for when once the interior of the large sheaves of a heavy crop gets thoroughly wet, it should be untied and opened, or it will grow and mould. Those who mowed their wheat will find many ears sprouted in the butt end of the sheaf. Bagging is, on the whole, when time permits, the most economical and satisfactory operation, for the heads of corn are in their right place, and very little is left on the field. If wheat is to remain in stack some time, carting it in a shower is of no consequence, for when pressure comes on it, and the roof is made secure by thatch, the water vaporizes and escapes through the reedy straw. This would not do in a dense haystack, nor with soft spongy straw accompanied by weeds. In a treacherous season, or pluvial district, all crops should be sheaved. I hear that this is done even with clover in certain districts. The clover is tied in bundles, and stands heads upwards. We south-country people are so used to fine dry harvest weather, that a contrast takes us by surprise, and finds us somewhat at a loss for expedients.

Old wheat, of which there is an abundance, now finds a ready and profitable sale. Millers are very shy of the new crop, which comes to market in some instances "like grains;" consequently only those will buy it (at a considerable reduction) who have proper drying apparatus. Here, again, permit me to give a hint, which I find profitable. When threshed and on the barn floor, if a dry or windy day, let a man keep constantly stirring it over for a day or two. The cost of 4*s.* for two days' work is a mere fraction compared with the advantage derived. It is not pleasant to be snubbed *in the market for a* bad sample.

Spread on a cloth in the sun is good, but remember it

must be moved. In a stagnant heap it heats and sweats rather than dries.

The old system of reaping is the most dangerous in a wet season. The tightly-bound and close-fitting straws, when wet, are slow to dry compared with the more loose and open sheaves of bagging or mowing or machine-cut.

We finish harvest on the 30th, including beans, if the weather is tolerable. It rains now.—*Aug.* 28, 1865.

THISTLE SEEDS.

Now is the season for thistle-seeding, and the winds will distribute them far and wide. Some say they are carried five miles annually.* What should we say to any man who dare sow seed weeds broadcast over our lands? And yet, practically, those who permit thistles to flourish and bloom unheeded, either on their own or their neighbours' property, are guilty of a suicidal neglect. A visitor to my farm assured me that his relative brought an action against a neighbour who refused his application to have the thistles cut down, and recovered damages and costs. Unfortunate holders of little fields and great hedge-rows had need watch attentively on this matter of seed weeds. Hence the great value of scarifying immediately after the corn is removed, for weeds then flourish and ripen their seeds very quickly and abundantly. I have known very practical farmers who did not believe that thistles ever seeded, or at least produced seeds that would grow.—*Oct.* 5, 1865.

CABBAGE *v.* SWEDES.

In our county, with stiff clay and hot sunshine, experience has taught me the superior value of cabbage for feeding purposes. We are now cutting the London cabbage planted in March, which will be followed later in the season by the large cow cabbage planted in February; and I am advised that it is useful to have Savoys to succeed these, as they stand winter best. Our beasts progress faster on cabbage mixed with plenty of fine-cut wheat straw and cotton-cake than with any other vegetable. This is consistent with the

* *They have* been seen at sea 20 to 50 miles from land.

analysis in Morton's excellent "Cyclopædia," which gives to cabbage 1 flesh-forming to 3 carbonaceous or heat-forming, while in potato the flesh-forming is only as 1 to 20. It is also rich in mineral matter. Its analysis proves the necessity for using with it a considerable quantity of carbonaceous matter. This we give in the wheat straw cut as fine as ⅛ to ¼ of an inch in length. When our engine is at work, the whole cabbage, stalk and all, is passed through the pulper. At harvest time the leaves are chopped, and the hard and hearted part passed through Gardener's turnip-cutter to prevent choking. I have 6 acres planted with cabbage in July—growing fast—after a heavy tare crop. We save time by planting out cabbage, and get a much greater quantity of good food. The cost, also, is really not greater than the Swede crop. As to exhaustion, it is idle to talk about it while we have guano and sewage. The effect of sewage irrigation on cabbage is excellent. Every year convinces me that straw should be used as food rather than as litter in open yards for soaking up water. My boarded or sparred floors still retain a firm hold on my good opinion as a real economy both of straw and labour, and essentially as conducive to animal health. Farmers will never get the full value for their root and green crops until they make greater use of their straw (including particularly bean straw) for feeding purposes. Experience and observation confirm me in this opinion. Aug. 3:—Our wheat harvest progresses favourably in spite of some showers, the straw being very stiff, and the land free from weeds. Several of my fields of wheat are estimated at near 7 quarters per acre, which I believe to be correct; for the ears are this season remarkably well set, and the kernels plump. One field of Rivett wheat (sown with my usual quantity, 1 bushel per acre) is estimated to produce near 8 quarters, although it followed a crop of white wheat which last year yielded 54 bushels per acre. That Rivett wheat was manured, when sown, with 2 cwt. of Peruvian guano and 1 cwt. of salt per acre. My other wheats are grown after beans, clover, and mangel. Mangel will be, generally, a very heavy crop on the stiff clays. I never saw them look better. There are also very fine crops of forward white turnips. I omitted to mention that if we are to grow heavy crops of cabbage after tares, we must have a good supply of summer-made under-cover manure. This, with deep trench-ploughing, makes the crop a sure one. As a *rule, we* do not in Essex make enough summer meat and *manure. Hence* we hear complaints of not being able to get

the straw trodden down. I prefer hearing that we are always rather short of straw. It means more meat and more manure. I am generally a straw buyer, although I grow so much, and yet all my manure is made under cover.—1865.

BRITISH TILLAGE—PRESENT AND FUTURE.

Read before the London Farmers' Club, Feb. 5, 1866.

If, in the progress of this discourse, I feel compelled to cast some censure on British tillage, I trust that all good farmers will consider that I treat of British tillage as a whole, comprising the tilled portion of those 57 millions of available acres which are estimated as the agricultural area of the United Kingdom, and that I especially exempt from reproof all good cultivators, of whom I know so many. I have, during the last thirty years, closely observed

THE GENERAL DEPTH OF OUR CULTIVATION,

and found that about 4 to 4½ inches is the full average depth. I do not mean when broken up, but as taken on the solid or land side of the plough. I have often discussed this question with my hospitable farming friends over a glass of their good port, and when they indignantly repudiated the depth of 4½ inches, I quietly pocketed an empty wine-glass, and on reaching the newly-ploughed ground, with the plough still in its work, placed the glass against the solid or land side, and generally found its mouth considerably above the land (ordinary wine-glasses rarely exceed 5 inches). I might have won many wagers on this matter. When I hear of 9 to 12 inches' depth by horse-power, I am naturally sceptical, until convinced by actual admeasurement. I have on more than one occasion found the depth of cultivation only 2½ inches. I believe we never shall have very deep cultivation, until we substitute steam for horse-power; for ploughmen, as a rule, are so fond of seeing fat and sleek horses, and are altogether so careful of them, and of their own shoulders too, that they have a great aversion to deep cultivation, especially in hard or tenacious soils. It is amusing, or annoying, to see how *they "ease off"* the difficult places, by raising the *point of the plough* or throwing it a little sideways, leaving

an uneven and ill-ploughed floor. Now, when we consider that one inch of soil per acre is fully 100 tons per acre, we can estimate the importance of ample depth. I always, in preparation for root crops, trench-plough with a plough without the breast, drawn by four horses, following in the track of the first plough, drawn by two or three horses. This breaks up the subsoil, and partially mixes it with the surface-soil and manure, without bringing it to the surface. Before doing this, the field is well scarified, harrowed, and any twitch removed immediately after harvest, and then heavily manured. The manure thus falls in among, and gets partially mixed with, the poor subsoil. When ploughing the land after the removal of the root crops, my ploughmen complain of having no bottom for the plough to slide on; they miss the (to them) comfortable hard floor on which the plough used to slide. Sometimes after wet weather our rank clay, or "loam," as the natives call it, throws out the plough, unless a boy or a heavy weight is placed upon it. A Scotch farmer said to my bailiff the other day, "We have no such land as this in all Scotland." It certainly is like pitch, putty, or birdlime in winter, and although when wet as slippery as butter, often like cast-iron in summer; and yet, by drainage, good manuring, and deep cultivation, it produces large crops of wheat, beans, and mangolds. But I may be asked, "Would you bring to the surface by deep ploughing the rank and bad subsoil?" My reply would depend upon the nature of the subsoil. If that subsoil is a rank, unaërated, and undrained clay, or otherwise unfitted to receive the young plant, it would, as in my case, be ruinous to bury the topsoil and cover it with the villanous subsoil; but why is it villanous? and how can it be amended? I will answer that question presently. If a subsoil is of such a quality that, on placing some in flower-pots, plants will flourish in it, you need not fear to bring it to the surface. I proceed now to consider

WHAT OUR DEPTH OF CULTIVATION OUGHT TO BE, AND WHAT IT PROBABLY WILL BE.

But let me not be misunderstood, and do not suppose that I am advocating deep cultivation for all soils; on the contrary, we know that on light, sandy, loose, and non-adhesive soils compression rather than cultivation may be necessary; but *I allude more particularly* to our dense clays and hard-bottomed soils of every description. I know some very good

farmers who do not even exempt hard chalks, although there is a difference of opinion upon that point. But, before very deep cultivation dare become general, those unfortunate twenty millions of undrained acres, which, according to the estimate of our dependable friend Bailey Denton, still require tapping, at a probable cost of £100,000,000, or £5 per acre, must undergo that necessary operation. It would never do to break up the undrained soil below the ordinary furrow. It might fairly be presumed that no one now doubted the value of drainage on stiff clays; but I am sorry to say that some even of my neighbours still say that 4 ft. drainage 28 ft. apart in stiff clays is of no use; it being too deep! and too far apart! Some, however, have recanted their errors, and have benefited proportionally: I hope more will follow them. It would be beside our present question to give the thousand-and-one obvious reasons in favour of the percolation of water and air through soils and subsoils by artificial drainage, or to suggest the necessity or propriety of economizing our drainage water for the purpose of spring and summer irrigation. I may, however, be permitted to say that a gentleman near Faringdon is making 50 acres of tanks, or reservoirs, for the purpose of irrigating his grass land with his drainage water.

WHY IS OUR SUBSOIL VILLANOUS? AND WHY IS OUR SURFACE-SOIL, WHETHER CULTIVATED OR NOT, ALWAYS MORE OR LESS PRODUCTIVE?

I wish I could induce many of my brother-farmers to keep company with Baron Liebig in these long winter evenings. It is so pleasant and so instructive to follow that wonderful and powerful mind in its researches into nature's mysteries, and thus to understand and appreciate the all-wise, but hitherto mysterious arrangements for the provision of food for man and beast. The surface of the earth almost everywhere, except in pure sands, is covered with forests or other vegetation, without the aid of manure or cultivation. We may strip off and carry away all the cultivated or top soil, and leave bare the poor subsoil. Yet, after awhile, this again becomes covered with vegetation. This actually takes place on our poor heath, whose surface has, time out of mind, been dug of and carried away. The elements of air and water acting on the inorganics of the soil, produce this result: the *growing of a crop* fertilizes the soil; it is only the *removal of that crop* that impoverishes it. Well, then, if the

presence of air is needful to fertilize our soil, its absence in the subsoil explains its poverty; but there are also other reasons. The four or five inches of cultivated soil have the power to arrest and fix for the use of plants the most valuable elements of the manure, viz., potash, ammonia, and phosphate of lime, so that the subsoil never gets any,—at all events a very small proportion. By cutting a vertical section, we see the poor and pale subsoil under the few inches of dark and cultivated surface. It is this poverty of the subsoil that militates so much against the development of those deep-rooted plants which cannot thrive unless they find in the subsoil (their feeding-ground) the necessary elements for their formation. Here let me pay a tribute of justice to that clear-headed agriculturist, whose sagacity in the field is a practical and concurrent illustration of Liebig's theories in the cabinet. The Rev. Samuel Smith, of Lois Weedon, has taught us a great practical lesson. He turns back the surface-soil, thereby doubling its quantity, and leaves the subsoil exposed for a year to the atmospheric influences. Into that subsoil he incorporates the manure, knowing full well that it could never reach that subsoil through the surface-soil. In consequence of this aëration and amelioration, the subsoil becomes attractive to the roots of the adjoining and following crops, giving surprising and most profitable results. His subsoil soon loses its poverty, and becomes rich in fertility, while that of his neighbours remains unaltered. I once deeply trenched a field on the great ridge, and buried pig manure in the bad subsoil, in the furrows. The surface-soil had been manured prior to the trenching. The result was 43½ tons of mangel per acre, and good crops ever since. It is to deep cultivation and good manuring that I owe my great crops. All my heavy land (1865 crop) has yielded 7 quarters per acre (one field 7 qrs. 5 bush.) of fine wheat, and I get 5 qrs. per acre off my poor light land. The disbelief of the profitableness of deep tillage is too general not to be surprising. I think, however, that this prejudice is slowly but gradually giving way after drainage and the steam-plough. Often, when I have been told that "deep cultivation will not do on this soil," I have archly asked, "Have you no cottage gardens in this vicinity?" and I too frequently see a marked and peculiar change of countenance come upon my respondent, as if it had never struck him *before* "that it won't pay to cultivate a garden so shallow as *a field.*" *We ought to consider*—

HOW DEEP THE ROOTS OF PLANTS GO IN SEARCH OF FOOD,

and then we shall no longer be surprised at the gradual failure of our turnip and clover crops, which find an empty cupboard in the unmanured and exhausted subsoil. Baron Liebig sagaciously observed that all the attempts of Messrs. Lawes and Gilbert to grow clover continuously, by heavily dressing the surface-soil with various manures, failed, because these manures never reached the subsoil or feeding-ground of the clover roots, the topsoil having arrested and fixed, or appropriated those manures, which really ought to have been buried and intermixed with the poor subsoil. In a rich old garden, where the subsoil had been long and well fertilized, the same gentleman could grow red clover annually. It is very probable that only enough of the manure we apply to the surface reaches the subsoil in eight or twelve years, so as to enable us to take a red clover crop once in that period. The young clover plant thrives well until in the spring its roots descend to the subsoil, and then it perishes for want of proper nutriment. When the clover crop was first introduced into this country and Germany, clover could be frequently grown; but it appears now to have exhausted the small store of its elementary constituents which existed in the subsoil. It is not unreasonable to attribute to the same cause the frequent failure of our deep-rooted turnip crops. Many of us are not aware to what depth the roots of annual plants will penetrate where there is a free passage for the roots and for air and water. In a clay-pit belonging to my neighbour Mr. Dixon, of Rivenhall, which had been somewhat undermined for brick-earth, a mass of earth 20 feet thick fell over loosely, and was afterwards sown with parsnips. My friend, observing a fine one, desired his man to pull it up, which he did, and the vertical root measured 13 feet 6 inches; but it was evidently longer, for it had broken off and left a piece of its root still deeper in the soil. Lucerne has been known to go very much deeper than this parsnip. The imperfect development of some of our cereal crops arises from an ill-conditioned subsoil. Wheat-roots occupy the subsoil to the depth of four or five feet, therefore the condition of that subsoil as to manure and drainage must materially affect the crop, as we see by the yellowness or "going off" of many wheat-crops in May, *when the roots attempt* to search for food in the unaërated *and unmanured subsoil*. It was not known until discovered

by Way, and confirmed by Liebig and others, that a few inches in depth of surface-soil has the power to fix or retain all, or nearly all, the food of plants which our manure contains, such as potass, phosphate of lime, and ammonia, thus preventing its passage into the poor subsoil.

WE MUST LOOK TO STEAM-POWER FOR DEEPER TILLAGE.

Although deep tillage by either hand or horse labour will pay, still both must succumb, in matter of economy, to untiring and all-powerful steam. The question of tilling the land at the right time would be, in itself, a sufficient reason for using steam-power. In a long summer's day, how vexing it is to see our sufficiently-worked horses return home at one o'clock in the day, having ploughed their acre; while, by the use of untiring steam, from five to eight additional hours would have become available! It is precisely during the dry weather that steam is most useful, both as regards facility of locomotion, condition of soil, and destruction of weeds. We can thus deal readily with those tenacious but fertile clays which are almost impracticable during the wet and winter months. The time is coming when suitable roads and properly-squared fields will be considered indispensable for the most economic application of steam to tillage, and this will also bring with it a much more ready and economical system of exchanging, purchasing, or selling land. In an economic and business point of view, our ill-shaped and over-wooded fields, ill-placed homesteads, and muddy lanes are a commercial disgrace, for farming should be treated as a business. In the most successful practical instances of the use of steam-ploughs the fields are large and rectilinear, the fences low and few, and the roads hard and well kept. In some cases the machinery is let out, at a moderate price, to the tenantry, when not required on the home-farm. Having used a fixed steam-engine for eighteen years on my own farm, for thrashing, grinding, crushing, pumping sewage and water, chaff-cutting, root-pulping and root-cutting, sack-elevating, and cake-breaking, I can vouch for its efficacy as an item in farm profit, where much stock is kept: I could not produce so profitable a result without it. Even its waste steam is used for boiling water, cooking chaff, &c. My engine, although eighteen years old, is likely to last for many years longer; my boiler I have just exchanged for *a larger one; I am sorry* that, it being fixed, I cannot use it *for tillage; but* with 56 head of cattle and 230 sheep, the

engine is almost always in request, especially for occasional sewage irrigation. Every labourer on my farm is convinced that, even if horses could have done the work of my engine, it would have been at double cost. That valuable and able contributor to agricultural literature, Mr. J. C. Morton, has just collected, and published in the *Agricultural Gazette* of the 20th January, returns from a great many users of steam-power for cultivation. The general results singularly confirm the estimates of the judges of the Royal Agricultural Society: they show clearly a saving of one-half, as compared with horse-power; taking, of course, into account the quantity of earth moved. There is also an increase of corn-crop, arising from deeper cultivation, of about six bushels per acre. Drainage is greatly assisted, the land lying much drier, and more available. Aldermanic old thistles and docks, that have had comfortable and undisturbed possession of the hitherto-unmoved subsoil, are routed out of their stronghold, and expiate their long-continued depredations by an ignominious death. Some of the returns say that blocks or clods of earth weighing 2 cwt. are torn up by the steam grubbers and diggers. In these clods must be many an old sinner of a weed, which, under the old 4½-inch system of horse-ploughing, only had his nose cut off. It really seems as if my predictions of 1852 are likely soon to be realized, and that we shall soon see steam-cultivators of 50 horse-power employed, when suitable roads or tramways are prepared for them. Why not use them if it pays?—and all the evidence goes to show that increased depth produces increased crops. The case I quoted of the parsnip is evidence of the necessity for making the passage, both of water and of the roots of plants, less difficult, especially in dense adhesive clays.

I have received the following truthful letter from a distinguished member of our club, whom I now see present:—"I think there is a point or two you might take up in your paper with advantage. Many people who go into steam cultivation expect results from it which they have no right to entertain. The simple fact of drawing an implement through the soil by steam, in lieu of horse-power, cannot render the soil richer; 'tis only by increasing the *depth* of the tillage that steam-power is so beneficial. Again, it is not one deep stirring that will render the land permanently more productive: it must be followed up year after year. I know people possessing steam-cultivating apparatus who have done their land *little or no* good. To get over a great acreage is *their sole study*, and this, of course, at a sacrifice of depth.

One of the fields of mine you went over when at ———, eight years ago, had only a staple soil of some 5 inches—all below sheer clay; now, by constant deep stirring and exposure, I have from 12 to 14 inches of "staple," good dark-coloured soil. If you can spare a day to run down before reading your paper, I shall be glad to see you. I am confident that in twenty years' time no cultivator—at all events of strong land—will be without his *own* steam-cultivating apparatus, where the occupation is over 300 acres. I have not much faith in companies or letting-out; farmers used to hire their drills since I can remember."

THE COMPETING SYSTEM OF STEAM-TILLAGE.

I have neither the time nor the inclination to enter upon this debatable ground; there are so many attendant circumstances to be considered; namely, length of purse, form of fields and state of roads, size of farms, price of coals, water-supply, &c. One thing, however, is quite certain, that a 14 horse-power will move twice as much earth as a 7 horse-power. Steam is so uniform that there can be no mistake about this. Also we may use diggers and cultivators in dry weather, while in wet, sticking soils we must use the plough. I consider the decisions of the Royal Agricultural Society's judges very dependable. We may reasonably calculate upon the introduction of much more powerful engines when we are more convinced of the profit of deeper cultivation. We shall then contrive means for the easier locomotion on farms of such ponderous masses. Too often now they become embedded in our imperfect bases, and become for a long time unavailable or difficult to remove. I presume this is why it is so difficult to hire these engines for steam-ploughing, which I should be very glad to do occasionally. Some admirable work was done on my farm, in 1856, by Fowler's steam plough with Cotgreave's subsoiler attached, so that the lower earth or subsoil was turned over without being brought to the surface. How is it that this is now so seldom done? We could see for several years after that the crops were better on the portion so ploughed. I rejoice to see the active paper war going on as to the merits of the various systems of steam-cultivation. Our intelligent and pugnacious friend, Smith, of Woolston, has provoked an immense amount of reading which must have benefited our farming friends, by *interesting them* additionally in this important matter of *steam-culture*.

WHY STEAM-POWER IS MUCH CHEAPER THAN HORSES.

In first cost, for instance, we can buy a good fixed engine and boiler for £25 per horse-power, while a good farm horse for heavy land cannot be had under £40 to £50. Again, look at the percentage of disease and death which occur among horses; whereas our steam-engine is never troubled with gripes or colic, mange, farcy, staggers, or other horse-diseases, to say nothing of kicks, strains, lameness, and vices of temper. If you have breakage or a screw loose with your engine, it is easily repaired, assuming that you live in an advanced neighbourhood, where steam engineers have found it worth their while to carry on their business. Horses must be fed when not in work—not so the steam-engine. You can feed your engine for a shilling a long day each horse-power, while your living horse costs near double that amount for a very short day; and steam-life is much longer than horse-life. One man can attend to, feed, and clean a twenty horse-power engine, and be always with it. What a contrast in cost in this respect with real horses! In one respect, no one can doubt the advantage of steam-tillage: there is no treading or undoing of cultivation by horses. When it is considered that, independent of ploughing, there is drilling and frequent harrowing (sometimes as much as eight or ten times in very heavy undrained lands), one can appreciate the advantage in this respect of steam-power. It is creditable to Mr. Smith, of Woolston, that he works his drills and harrows by steam-power. I rejoice to be able to state that there are at least six hundred sets of steam-cultivating tackle at work in various parts of the United Kingdom. How many thousands will there be in another ten years!

We must all have observed

HOW MUCH PLANTS ARE IMPROVED IN APPEARANCE AFTER EITHER HAND- OR HORSE-HOEING,

independent of the removal of weeds. The cause is thus explained by Baron Liebig, whose powerful mind deduces some new theory from almost every experiment. He says:—"The outermost crust of the earth is destined for the development of organic life, and its broken particles are endowed by the wisest arrangement with the power of collecting *and retaining* all the elements of food which are *essential for the* purpose."

How significant are these words—"broken particles!" and how regretful it is that our "outermost crust" is only about five inches thick, and too often "unbroken," or imperfectly broken! I wish that you would read in his books his beautiful description of how the "outermost crust" not only collects and retains all the food-elements that we put into it as manure, but also how the "broken particles" collect from the air, during hot dry weather, moisture (with carbonic acid and ammonia), and how this absorbed moisture warms and fertilizes the soil, and moderates the cooling of the ground from radiation. How important, then, it must be to thicken this "outermost crust" by steam-tillage, and increase its quantity of "broken particles," so that they may "absorb from the deeper-lying moist strata that constant distillation of water which is taking place towards the dry surface, accompanied by a corresponding evolution of heat in the upper strata on its absorption of the vapour."

TILLAGE IMPLEMENTS.

It would be an insult to this Club to define the varied and efficient implements of tillage which at our great annual agricultural shows attract so much attention, and bear testimony not only to the increasing intelligence of agriculture, but especially to the enterprise and skill of our well-known implement-makers. I am sorry, however, to be obliged to say that much loss occurs on too many farms by the use of ill-conditioned implements, particularly harrows, whose teeth, worn down to a stump, cannot pulverize and intermix the soil as they should do to form a perfect seed-bed. It is like using a rake without teeth, or merely the stumps of teeth. Many farmers have yet to learn that iron harrows with steel teeth would be a great benefit to them compared with the trumpery wooden ones that bound over the land without penetrating it. One can hardly wonder at misplants arising from water stagnating in the drill coulter marks, or the ravages by birds on the imperfectly covered seed. Ploughmen like light harrows, or any other tool that will ease their horses. The non-use of the horse-hoe among drilled corn crops is an unprofitable omission. I have used Garrett's horse-hoe for twenty years. A man with a pair of horses clean-hoes between the rows 12 acres of wheat or beans a day, and sometimes, with an extra pair of horses, he has clean-hoed 22 acres of *wheat in a long* spring day. This hoeing should be done *among corn before the* spring roots push into the rows. Root

crops especially require frequent horse-hoeing. Tillage in every shape is beneficial in more ways than the mere eradication of weeds.

TILLAGE ANOMALIES.

I have many times seen, in certain counties, four horses at length drawing a plough, attended by a driver and ploughman. I should not, perhaps, object to this, provided they stepped together, and ploughed twice as deep as a pair of horses. I am sorry, however, to say that I have often found that a pair of horses would have sufficed for such shallow work, and that a useless expense had been incurred, especially on light soils. The high ridges and deep furrows of the serpentine lands of the midland counties testify to a peculiar system of ploughing, or gathering towards a centre, which must have originated in a desire for surface-drainage before under-drainage was practised, the serpentine form being chosen to prevent the too rapid rush of the flood-water. The result is, too often, a crop ripe on the top of the ridge, while in the furrows it is green, or unripe, and weedy. Under-drainage is gradually abolishing this unprofitable system of tillage.

BARON LIEBIG ON TILLAGE.

Heavy land may be very quickly got clean and in condition by the plough, the Crosskill clod-crusher, and heavy, deep harrows with teeth 1 foot to 18 inches long. Of course, this must be done in dry weather, after very deep ploughing and subsoiling, the surface having been scarified immediately on the removal of the corn crop. Liebig points out to us how necessary it is to separate each granule so far as practicable. Many of the baron's remarks and discoveries in connection with tillage are so original and so valuable, that I wish I had time to quote them all; but, failing that, I recommend a careful study of his works, particularly "The Natural Laws of Husbandry," "Letters on Modern Agriculture," and "Principles of Agricultural Chemistry." We should then know why salt, nitrate of soda, and superphosphate are useful in some cases, and valueless in others. Permit me to read the following quotations from Liebig's fifty principles of agricultural chemistry:—"A certain physical or mechanical quality or state of the soil is a necessary condition to the efficacy of the food which is *present*. The soil must admit the free passage *of air and water*, and allow the roots to spread on all sides in

search of food. All plants, without exception, require for nutrition phosphoric acid, sulphuric acid, the alkalies, lime, magnesia, and iron. Some important genera require silica. Those which grow on the sea-shore and in the sea require common salt, soda, and iodides of metals. All these substances are included in the term 'mineral food of plants.' Carbonic acid and ammonia are the atmospheric food of vegetables. Water serves both as a nutritive substance, and, as a solvent, is indispensable to the whole process of nutrition. The different substances necessary to the growth of a plant, or the different articles of their food, are all of *equal value*—that is to say, if one of the whole number be absent, the plant will not thrive. To improve, enrich, or fertilize a soil by proper means, but without adding to it any mineral constituents, is to render movable, soluble, available for the plant, a part of the dead or immovable capital of the soil. Stagnant water in the soil, which excludes the air from access to the insoluble compounds, is an obstacle or resistance to the weathering. Fallow is the time during which this weathering takes place. During fallow, carbonic acid and ammonia are conveyed to the soil by the rain and the air. The ammonia remains in the soil, if substances be present in due proportion which deprive it of its volatility by combining with it. Land in which the necessary mineral constituents are not present in any form cannot be rendered fertile by fallowing or by ploughing. In a soil rich in the mineral food of plants, the produce cannot be increased by adding more of the same substances. In a soil rich in the atmospheric food of plants (rendered so by manuring), the produce cannot be increased by adding more of the same substance. Careful mixture and distribution of the nutritive substances present in the soil are the most important means of rendering them effective . . . . The influence of the mechanical operations of agriculture upon the fertility of a soil, however imperfectly the earthy particles may be mixed by the process, is remarkable, and often borders upon the marvellous. . . . . One of the principal requirements of the practical farmer is to know the causes, as well as the means, whereby the useful nutritive substances present in the soil, but not in a form available for nutrition, may be rendered diffusible, and capable of doing their work: the presence of moisture, a certain degree of heat, and free access of air, are the proximate conditions of those changes by which the nutritive substances in chemical *combination are* made available for the roots. As the smallest *portions of food* cannot of themselves leave the spot in which

they are firmly fixed by the soil, we can understand what immense influence must be exerted on its fertility by its careful mechanical division and thorough admixture. This is the greatest of all the difficulties which the agriculturist has to overcome. If a field is to produce a crop corresponding to the full amount of food present in it, the first and most important condition for its accomplishment is that its physical state be such as to permit even the finest rootlets to reach the spots where the food is to be found. The extension of the roots in every direction must not be obstructed by the cohesion of the soil. Plants, with their delicate roots, cannot grow on a tenacious heavy soil, even with abundance of mineral food. None of the three most important constituents of food (potass, phosphate of lime, and ammonia) exists by itself in a soluble form in the ground, and none of the means employed by the agriculturist to make them available to his plants deprives the soil of its power of retaining them, or, if dissolved, of withdrawing them from the solution. The principal end gained by the means he employs is only a uniform distribution of the food throughout the soil, so as to put it within the reach of the roots of his plants." Baron Liebig says that irrigation of meadows brings the ground into a condition similar to that produced by careful ploughing, and explains why it is so. His general conclusion is that we have in many soils a considerable amount of mineral nutritive substances, chemically combined, and therefore unacceptable to plants, which require to be dissolved and physically condensed on the surfaces of the granules of the soil, from which the rootlets of plants might then easily obtain them. Tillage tends greatly to this result. It is the infinitesimal divisibility and solubility of guano which render it so valuable in proportion to its bulk. By tilling well the soil, separating and intermixing its granules, exposing them to a marriage with the air, a thousand fertilizing influences are brought into play; for the earth and the air are both, like doctors' shops, full of chemicals with strong and peculiar affinities, which can only be indulged when permitted, by ample, frequent, and perfect tillage, to come into each other's presence. The dense, hidden, and hence infertile subsoil requires to be brought into the presence of air and light, when its poisonous protoxide becomes fertile peroxide, and no end of pleasing and profitable results ensue. Dr. Daubeny found that there was in the soil and subsoil a large amount of nutritive substances in a passive, and therefore unavailable *condition*. Liebig shows how tillage and manures, *aided by air and water*, render these unused substances avail-

able and profitable. My sagacious practical friend, the successful grower of roots, who tills his land so frequently both before and after manuring, considers the fallow imperfect, unless the soil is fine enough to go through a sieve. Here is a practical man, who never read Liebig nor probably heard his name, and yet, by a natural perception and sagacity, is working out that great man's theories with as much exactitude as though he had studied his books.

IN CONCLUSION,

We, as agriculturists, have now to compete with the whole world in the production of food. If that competition is to be as successful in corn and meal as in cotton, it must be by the general use of that cheap and mighty power—steam. It is quite as much a landlord's as a tenant's question, for their interests are identical. The less remunerative the practice of farming becomes, the lower will the rents be. No sensible men will continue to invest their capital in the land of another without a profit. Before we close this subject, let us not forget that great advocate of tillage Jethro Tull. His sagacious and perceptive mind all but divined the mysteries of chemistry, which then, as applied to agriculture, were undiscovered. Happily, since that useful man's time, Davy, Liebig, and other able chemists have unveiled Nature's mysteries, and shown to us the why and wherefore of agricultural fertilization. Let us pay heed to their advisings, and no longer treat agriculture as an empirical art, but render farming more intelligent and more profitable. There is something to be learned from the story of the old man who, on his dying bed, told his sons to seek in his field for money which he had somewhere buried there. The soil and subsoil were carefully and deeply examined. They did not find the actual money; but they found ample money's worth in the greatly-increased crops resulting from deeper and better tillage. I think you will agree with me that we are approaching gradually, but surely, to a state of things which I ventured to predict at the conclusion of a lecture which I read at the Chelmsford Literary Institute in 1852; and as it harmonizes perfectly with my present feelings, I will, with your permission, repeat it: "I see in perspective a railway activity pervading British agriculture. The time is coming when *farms* will be squared, trees removed, and game moderated; *when tramways* will intersect estates, and one horse will *draw to market* the load of four; when the sewage of our

towns will ebb back to its original source; when the waters of our rivers and drains will be applied to the irrigation of our fields; when our millers will use steam instead of water; when our farmers and their children will be better educated, and rank higher in the social scale; when our labourers will be better housed, taught, and fed. Then will the blundering rudeness and clumsiness of ignorance be exchanged for the watchfulness and thought of an enlightened intelligence; then will the fractional calculations of profit outweigh the fears of cost; then will antiquated territorial legalities be superseded by personal responsibility, identity, and possession. I see all this in perspective. It is a mere question of time. I see mighty engines in railwayed open fields, tearing up furrows a yard deep, making the land look like a sea; I see those hungry earthy masses saturated and immediately fertilized with the sewage of our towns. I see ample evaporation and facile percolation. Tottering and dilapidated farmeries will give way to permanent and convenient homesteads; the pinching economy of a penurious and pernicious system will be exchanged for liberal views and large operations; capital will develop its giant strength, unfettered by seigneurial restrictions; agriculture, commerce, and manufactures will unite, by the ties of a great common interest and common intelligence, for the good of our people and for the honour of this great nation."

THIN-SOWING.

A PECK AN ACRE OF WHEAT.

LET us keep our minds unprejudiced in this matter, and open to conviction, by small and continued experiments, which will give us safe ground to act upon. I wish that it were possible that all agriculturists could see my experimental half-acre of wheat, dibbled with one peck per acre, in all the stages of its growth. I see it daily from my window, and it suggests no end of reflections. There are the four stetches, looking in the distance like a bare fallow; while the rest of the field, sown with four pecks per acre (my usual quantity), is as green as a grass-field. Judging from its appearance, I should at once condemn it as a failure, and yet we know from past experience, and feel confident, that these bare lands *will, at harvest,* produce a crop as abundant as the *green mass that* surrounds it.

It would be most interesting to record, by shorthand notes, all the feelings engendered by an inspection of those bare stetches by practical agriculturists during the various stages of the wheat's growth—from positive disbelief and doubt, passing, in gradation, to the admission of surprise and conviction at the result, so successful but so unanticipated. But so it is, and we felt it ourselves more than once. There are the little plants from single kernels at intervals of 6 inches by 4½, and on looking closely to them we see peeping out the tiny but numerous shoots that are to radiate horizontally, and cover the ground with strong and reedy stems, so that the field will look as though it had been rolled with an immense roller, and every stem almost glued to the soil. In due time those horizontal shoots will take an upward movement, having at the time that admirable and useful curve of resistance, which enables the plant to hold its erect position, regardless of winds and storms. How different at harvest from the laid and injured crops which, owing to crowding, are compelled to go up at once vertically without the curve of resistance. How small the kernels and dull and soft the straw of the thick-sown compared with the bright and glossy seeds of the thin-sown, whose plump, well-developed kernels give unmistakable evidence of a more natural and proper proceeding.

When harvested and "traved," or shocked, the contrast in the straw is most striking and convincing. By this thin-sowing you get more straw (tested by weight), as well as more corn, than by thicker-sowing; besides the absence of mildew. Said a Wiltshire man to me, just before harvest, as he was closely examining each plant, or bundle of growing stems—"Well, Mr. Mechi, you might have written all your life about this, but I should never have believed if I had not seen it;" and it certainly is very wonderful that the stems from each kernel should range from 10 to 30; but so it is, and this does not depend upon the quantity of the seed sown, but upon the quantity of nutritious matter in the soil available for the growth and full development of the plant. Twenty times as much seed would not produce a crop where there was not available food.

I will now describe the whole of the facts quite irrespective of mere opinions. On one clover lea yearly, when I have drilled my usual quantity (4 pecks of wheat), I dibble in, on *four lands or half* an acre, half a peck of wheat, which is one *kernel in each* dibble-hole, 6½ inches by 4 inches apart. *It is dibbled* at the same time as the rest of the field,

sometimes in October and sometimes in November, so as to be a fair comparative trial. The land is strong clay land. I have not yet tried so small a quantity on the light land, although I shall do so next year. I fear, however, it might not answer so well on light land, on account of birds and other reasons. The yield from this peck an acre was, in 1864, 58 bushels per acre, and 2¾ tons of fine straw. This last year, 1865, the yield was 58 bushels per acre (the straw not weighed). In both years the yield exceeded the remainder of the field by 2 bushels per acre, and the straw in 1864 was also more abundant. This year (*D.V.*) I shall duly report the results, which I have no doubt will be the same; and yet with these facts so patent I lack the courage to reduce my quantity from a bushel generally. By these repeated trials I shall, however, gain confidence, and probably drill an acre or two in each field with 2 pecks. Last year I thought it impossible that the thin-sown could equal the bushel, for it went in badly, and altogether looked like a failure.

The peck of thin-sown red wheat only equalled the thicker-sown red in 1864, but the white beat the thick-sown white by 2 bushels. In 1864 both red and white thin-sown carried the day over the thick-sown. All my heavy land wheat in 1865 averaged something over 7 quarters per acre.

I don't believe that farmers know how much they often lose by thick-sowing. They would do so if they tested, as I have done for years, comparative qualities on a small scale. Every man should thus judge for himself according to his soil, climate, and other circumstances of condition, &c.

The frothy straw and light kernels of a thick-sown and early-laid grain crop are a losing affair.

If ever we hear of an extraordinary yield, it is usually from a crop so thin in the spring that its owner thought of ploughing it up; but after well harrowing, &c., it branched amazingly, and became the best crop on the farm.

It is clear that there is some gross error in sowing when our average increase is only nine kernels for one. Mine is at least 40 to 58 for one.—*April* 4, 1866.

A SATURDAY MOON ONCE IN SEVEN YEARS.

When our men agreed for their harvest wages, they *pleaded that it would* be a long one, because the new moon *in August would fall* on a Saturday. Singularly enough it

was a really wet moon. Again, in October, it came on a Saturday, and again we had a very wet October; although, from my own observations, we have twenty-one fine days in every October as an average. There would be more, but for the once in seven years wet moon. Had we attended to the old saying, and taken warning by it, a vast amount of corn would have been saved from damage by early carting. I shall not neglect it for the future. I see by the almanack that the only Saturday new moon this year is in December next, on the 15th. Many old country sayings or prognostics are worthy of our attention, having been based on long-continued observation.—*April* 4, 1866.

ON THE CULTIVATION OF GREEN CROPS, AND THE MOST ECONOMICAL WAY OF CONSUMING THEM.

Read before the Wenlock (Salop) Farmers' Club, Monday, 9th April, 1866.

I ACCEPT cheerfully the task you have assigned to me, and I first ask,—Why is an extension of root and green crop cultivation necessary and profitable?

In a new country where Nature has reigned supreme, and where, for ages, vegetation has grown and decayed, unremoved by the hand of man, and where the action of the elements and seasons (called the "hand of time") has rendered soluble and available the mineral food of plants, we might remove year after year the most exhaustive crops without for a long time returning to the soil any manure. The cultivation of root and green crops under such circumstances is not required. Now, however, we have quite a different state of circumstances to deal with.

A vast extent of pasturage and wood land has been broken up and worked out. Wide rentless wastes no longer afford a cheap means of raising our store stock; our 60 millions of acres, that seventy years ago had only to feed some 10 millions of people, are now called upon to answer the hungry demands of a population of nearly 30 millions. This necessitates *a different* and more artificial and intensified system *of agriculture, both* as regards landlord and tenant.

High and increasing rents must be met by maximum crops.

Animals must no longer wander over large areas in search of a scanty supply of food, but we should force from the soil, by high feeding of stock, by rich manuring of the soil, by deeper cultivation and drainage where required, heavy crops of roots and green food; and having produced these great and costly crops, they should be administered to our live stock on the most improved modern principles. All this cannot be done without the concurrent action of the landowner, who shall provide suitable buildings for the proper accommodation of the much larger number of animals which it becomes now necessary to keep. My experience of twenty-three years as a farmer has taught me that it will not pay to look entirely or mainly to the barn-doors for my returns, but that I must look to meat quite as much as to corn, and in fact the more meat you make, the greater crops of corn you will grow; for the man who produces three times as much meat as his neighbour must of necessity produce three times as much manure. It often pays much better to sell your crops to your stock rather than to the miller or factor. We do sell our root and green crops to our stock: why not sell them a corn crop? I always sell all my beans, peas, oats, and much of my barley to my live stock, so that these crops ultimately go to market on four legs, and 9-10ths of their elements are thus returned to the land. My live stock (on 170 acres) consume about £700 of cake and corn annually. After paying full *market* price for these, they, as an average, leave me from £6 to £7 per acre for my root and green crops. This, you will admit, is not an unsuccessful way of obtaining plenty of manure to fertilize your soil. It is, in fact, the key to my farming profit.

Let us now consider "What sorts of root and green crops we should grow."

That question depends upon soil and climate. In our Southern and Eastern counties, with very few hills, consequently with a small rainfall (under 20 inches annually), a dry atmosphere and high temperature, winter tares and winter beans may be safely grown. It is not so, I believe, in the colder North. A crop of cabbage, rape, or kohlrabi also stands our winter well. Italian rye-grass makes very early and good food; it is a thirsty, rapid-growing plant; in our dry climate there is no growth of it in the warm months without irrigation. Saintfoin and Lucerne do well on calcareous soils. Mine is non-calcareous. I often use part of *my bean-crop as green* food, passed through the chaff-cutter, *in July or August,* and I consider it pays me as well or

better than when harvested. It is first-rate food for stock and horses, and comes at a handy time,—after the cutting of the clovers. Cabbage at harvest time is essentially necessary, and very good, too, for working horses. My most dependable and productive root-crop is mangel-wurzel. Its deep, powerful roots penetrate and search our hard tenacious clays; its shining, expansive leaves rejoice in hot, bright sunshine; it never does better than when the leaves flag from heat, and are crisp in the early morning with dew. Swedes, on the contrary, seldom do so well in our stiff clays. They often mildew, and if sown early, are dried up by the 1st of September. They are rarely sown here until Midsummer day. They require more rain and a moister atmosphere than sun. We also prefer winter tares to those sown in spring.

Mangel are a great crop in our country this past season. I have nearly or quite 40 tons per acre. Swedes are comparatively a failure.

White turnips sown in July answer better with us than Swedes. Swedes thrive best in a moist or vaporous atmosphere and a friable soil. I have often been struck with the contrast, passing from Essex to Cumberland in a hot July or August day; our Swedes being barely visible and fly-eaten, while at Kendal and among the hills the blades were green, fresh, and knee-high. Those hills attract and arrest the masses of steam, called clouds; and thus plants flourish, although the moisture may not have descended as rain.

As to the "Preparation of the Soil," we may for all hard-bottomed or stiff soils lay down, as an axiom, that deep cultivation is profitable. I don't mean that the bad, unaired soil should be brought to the surface, but that it should be broken up by subsoil or trench ploughing before winter, and thus exposed to the action of frost, which beats all the harrows and ploughs, scarifiers and rollers, for pulverizing our heavy soils—I speak, of course, of drained heavy soils. I consider undrained heavy lands quite unfit for profitable farming.

I very much prefer putting on my manure before I plough and subsoil, because it then falls in and intermixes with the soil and subsoil, which is most important; and the winter rains distribute the soluble and valuable portions of the manure among the granules of the soil, where it becomes fixed for the use of plants, and cannot be washed out or *washed away in the* drains (see Liebig).

On the subject of tillage details I would refer you to a *paper recently read by* me before the London Farmers' Club,

a copy of which I beg to present to you. I find that if my land has been amply manured and deeply cultivated before winter, it is in the spring like an ash-heap, only requiring scarifying, harrowing, and drilling.

To plough up our heavy land in the spring would be to make it dry, blocky, and unfit to receive the seed—and this is why many people fail in their mangel plants.

I need hardly say that I consider it indispensable to scarify or broadshare all the stubbles immediately after harvest, thus preventing the growth of old weeds, and permitting the vegetation of any seeds of weeds. We also fork out carefully any patches of twitch or couch grass, shake the earth from them, and carry them off the land. All rubbish is harrowed or raked together, and burned or carbonized.

I have said very little about the preparation of loose or friable soils for root-crops. As a rule, they are easily dealt with at almost any period. A very able root-grower and large successful farmer tells me that he ploughs and rolls several times, both before and after manuring, and does not consider the land fit for turnips until it is fine enough to go through a sieve. His soil is more mellow than mine.

CULTIVATION OF GROWING CROPS.

Among the growing crops of roots, after being thinned, we use Garrett's horse-hoe between the rows, and the hand-hoes between the plants, our mangel standing about 12 to 15 inches apart, and about 28 inches from row to row. I never permit weeds to grow in my crops; it is like permitting a hungry, unwelcome intruder to devour part of your dinner. Nothing pays better than keeping down weeds.

I lay down as an agricultural axiom, "Never employ a man where you can use a horse, and never a horse where you can work a steam-engine." The reasons are obvious: a man costs as much daily as a horse, while the latter has six times the power; a steam-engine beats the horse in a like proportion; therefore, with Garrett's horse-hoe, which takes a width of 7 to 8 feet, a pair of horses and one man will clean cultivate from 8 to 12 acres a day. With two pair of horses my man has occasionally clean horse-hoed from 20 to 22 acres of wheat or beans in a long day. Our beans are harrowed well with iron harrows when they are one inch out of the ground, and receive in addition two or three horse-hoeings *and two* hand-hoeings; our tares are sometimes *horse-hoed, and our* clovers are invariably hoed in the spring

if there are any weeds to remove. A truss of clover will pay the cost of hoeing an acre.

MANURE.

Science and practice have proved that the very best manure is that made by fattening animals with rich food, such as linseed or rape-cake, beans and peas, or other substances rich in phosphates, nitrogen, and potass; but then remember that that manure must be made under cover, unwashed, and not like too much open-yard manure, which, after this wet winter, I would compare to tea-leaves when all the strong tea-solutions have left them. Agriculturists do not, I am afraid, appreciate that it is not bulk of manure that produces result, but quality. The soluble portions of the manure are the only portions available, the mass consisting of some 75 per cent. of water, and a quantity of woody fibre and insoluble matter. The mere peppering with guano, which surpasses the massive dung-heaps, has taught us a lesson, and, on its first use, created much doubt and disbelief. I rarely make a dung-heap, but usually cart my manure at once from under the animals to the field. This spares much useless labour and waste of manure.

The sheep-fold does well without any mixing or turning over. By steam-power I cut my straw into short lengths for litter, and it is always ready for carting and spreading.

The time is approaching when an open farm-yard and a dung-heap will be "the light of other days." The bottoms of all covered sheds and farm-yards should be paved with hard bricks set in cement. In a general way much of the best part of the manure soaks deeply into the soil and is lost to the land.

There is no reason why farm-yard manure should not equal the sheep-fold, were it properly economized.

I will now tell you how much manure I put on for a mangel or root-crop: 20 or 25 cartloads of shed manure, 4 cwt. of best Peruvian guano, and 2 cwt. of common salt. I lay down, as a rule, that we must "go in" for a maximum crop; it costs no more for ploughing, harrowing, rolling, sowing, drilling, hoeing, rent, rates, tithes, and horse labour, than a half or three-quarter crop. Then, why "spoil the sheep for a halfpennyworth of tar"? It is the minimum *crop that* keeps the farmer poor: too much land, and consequently *too little* capital. Better have one-half the space *thoroughly manured*, than spread it thinly over a double

area. We cannot over-manure or too deeply cultivate for a root-crop. Superphosphate alone never shows upon my farm. I presume I have already sufficient in my land by my rich cake and corn manure.

HOW TO CONVERT YOUR ROOT AND GREEN CROPS INTO MEAT TO THE BEST ADVANTAGE.

This is, in my opinion, one of the most important of agricultural questions, and one of very difficult solution. It is dependent on so many considerations, such as the breed and quality of your stock; whether you should breed or buy; the health and comfort of the stock as regards shelter, temperature, and, above all, purity of air by ventilation; and then again, the admixture of various sorts of food, and their state of preparation by comminution; and, when all these matters are in proper order, there is still one of importance —that is, a stock-keeper with keen perception and due regard for his master's interest; or, better still, the farmer's own eye, if a correct one.

If we are wrong on stock management, adieu to profit, for it is the sheet-anchor of farming. And here allow me to express my deep sympathy and sorrow for those unfortunate yeomen whose capital has been diminished or swept away by the dire cattle-plague. Surely this will move the hearts of the well-disposed to contribute largely to the Royal Agricultural Benevolent Institution. Allow me to say on this subject of the cattle-plague, that it is very desirable to call in a second or third veterinary before you carry out the inspector's directions to slaughter. I knew of several instances where inspectors have mistaken the complaint, and thus wasted much valuable property.

Salt is very important for animals, as for ourselves. Large blocks of rock-salt are always put into the mangers and feeding-troughs. One half the ash of animal blood consists of salt; without it the blood cannot be in a natural or healthy state. Some think that I owe to salt the exemption of my animals from cattle-plague. I presume ventilation and non-contact have much to do with it. I find salt unmistakably useful on drained soils.

We shall never agree as to "How much meat a ton of turnips will produce," until our modes of administering them are more uniform. The money estimate of value now varies from *2s. 6d. per ton* in the open field, to 7*s.* if pulped and *mixed with other food*, in warm and dry quarters. My live

stock account shows, on an average of years, that, after paying full market price for £700 worth of corn and cake, £200 is left for 30 acres of green and root crops, which, if taken as equal to 20 tons of roots per acre, would be 600 tons of roots, at 6*s.* 8*d.* per ton. I could not produce such a result except by comminuting the food, mixed with a large quantity of very fine-cut straw, and administered to the animals in warm, dry quarters. My irrigation also aids to produce so favourable a result. In Suffolk the estimate is that a ton of roots will produce 14 lb. of meat (net), and in Essex, a bushel of 56 lb. of roots is valued for consumption at 2*d.*, or 6*s.* 8*d.* per ton.

In order to test what return we get in meat for one ton of roots, I take the admission by many practical men that it requires 150 tons to produce one ton of meat, net butcher's weight. A ton of meat (2,240 lb.), at the present price of 7½*d.* per lb., comes to £74. 5*s.*; 150 tons of roots, at 10*s.* per ton, would be £75. I doubt whether we get near so much as 10*s.* per ton for our roots. At 5*s.* per ton, which is a much more probable estimate, it would require 300 tons of roots to produce one ton of meat, or, which is the same thing, 300 lb. of roots to make 1 lb. of meat. If therefore we grow on an average 20 tons of roots (which is in my opinion very far above the average), the return in meat would be £5 per acre.

Crops of turnips are sometimes "given away" to feed on the ground, but generally are sold for from 40*s.* to £5 per acre—very rarely the latter price in our county. You are no doubt aware that 150 tons of turnips contain 135 tons of water, and only 15 tons of dry substance. Hence the necessity for adding dry food to correct the excessive and injurious disproportion of water.

A pound of rumpsteak contains three-quarters of a pound of water. Our own bodies have 76 per cent. of water. Good dry hay only contains about 15 per cent. of water. We make a great mistake when we feed on fresh-drawn turnips alone. I am very anxious to receive from my brother farmers some carefully conducted experiments to show how much meat a ton of turnips or mangel would make under the most favourable and successful management. Can you enlighten me on this point? Mr. Lawes's valuable experiments, recorded in the Royal Agricultural Society's Journal, show *that no price* was left for turnips after paying for cake and *hay. This occurred* with several lots of 40 sheep of different *breeds fattened for* six months. One lot absolutely lost

£3. 13*s.* 6*d.*, besides leaving nothing for turnips. It is true that meat was cheaper then than now, but so were cake and hay. My system of plenty of fine-cut wheat and bean-straw and mixed food gives me much better results than those of Mr. Lawes.

Mr. J. C. Morton's experience with 4,000 tons of roots left only 3*s.* 4*d.* per ton after paying for the cake and hay. At this rate it would require the enormous quantity of 450 tons of roots to make one ton of meat. In Mr. Lawes's case it must have been very much worse than in Mr. Morton's, and would make it appear that feeding with cake and hay was a very losing operation, leaving out of view the quality of the manure.

I was very much amused by a farming friend telling me that it did not pay to feed with cake, but it did with home-grown hay. "Well," I said, "do you charge the animal's *market* price for your hay?" "Oh no!" he replied, "we only charge *half* market price, that is 'feeding price.'" I said, with a smile, "Charge 'feeding price,' that is 'half market price' for your cake, and then you will find that it pays you well." The same remark applies to pigs; pigs lose less money than any other stock; but then you must charge them "feeding price" for the barley they consume, the same as you do to your bullocks with hay.

It may appear strange, that while 7 lb. of barley, or bean-meal, or oil-cake, will make 1 lb. of meat, net butcher's weight, it takes 150 to 200 lb. of turnips to produce a similar result. In one case we must give water as well as meal; in the other we give 90 per cent. of water in the turnips—or equal to 13½ gallons of water to every 7 lb. of meal. It appears absurd to propose to do this, and it proves that turnips alone are not proper and profitable food for animals. I think about 2 gallons of water would be more proper than 13½ to mix with the meal.

Beware of too succulent and unripe food, especially for young and breeding animals *before* parturition. Young washy tares, young rank-growing grass, and roots, especially mangel, forced to a rapid growth by high farming, are all likely to produce scouring or inflammation of stomach. So are mildewed turnips and rape. The second growth of red clover, after the first growth has been folded with sheep, highly fed, is very dangerous and destructive to lambs, and even to older sheep.

Had we statistics, as we ought to have, an amazing amount *of loss would be* recorded under the above heading. It is

singular that mangel and roots, which are so destructive to sheep before parturition, may be given safely a few days after parturition, especially if mixed with some cabbage; and this remark applies in degree to other animals.

Male sheep, especially rams, suffer much in the urinary organs from the salt and alkalies in mangel-wurzel, especially if confined; when permitted to range the fields, there is much less danger. The ash of globe-mangel roots contains 24½ per cent. of salt, their leaves 38¾ per cent. Long red contain 14¼ per cent. in the roots, and 29¾ per cent. in the leaves.

Swedes and carrots only contain about 6 per cent. of salt in their bulbs. All these roots contain in their ashes a very large quantity of potass and soda; more than 50 per cent. of the ash of mangel is so composed.

The acrid substance in fresh mangel disappears, in a great measure, in the storing of this root, so that in the spring there is less danger with them. Swedes and carrots, from their small quantity of salt, may be given earlier, and in larger quantities. It is not to be wondered at that such enormous losses occur among flocks, and especially breeding flocks, when fed on the fields with cold and succulent turnips uncorrected by dry food; roots are, in my opinion, very dangerous for breeding animals before parturition.

Roots, especially mangel, are first-rate food for horses if given moderately with dry corn, hay, and chaff. But for breeding animals before parturition, and generally for young animals, cabbage may be very safely given, passed through the pulper and mixed with chaff. If we ask why, the analysis of the ashes at once explains it. In lieu of the 50 per cent. of soda and potass, and the 30 per cent. of salt, cabbage has less than 5 per cent. of salt and 30 per cent. of potass and soda, but it has (which is very material) 20 per cent. of lime and 5 per cent. of magnesia (globe mangel has only 2 per cent. of lime and magnesia); cabbage has 12 per cent. of phosphoric acid, mangel only 4½ per cent. It is thus easy to understand why cabbage abounding in flesh-forming substance is so innocuous and so suitable for animals in breeding condition. A certain proportion of cabbage given with mangel might mitigate the evil effects of the latter.

Kohlrabi has so much of the nature of cabbage as to be much more safe in the early season than mangel. It only *contains 10 per cent.* of salt, and like cabbage, stands a hot, *dry climate better* than Swedes.

[1] *The words* "extreme succulency" are of great agricultural

significance and import. Experience of a very unprofitable nature has taught me the danger of allowing animals to have free access to food in such a condition. If by sewage irrigation, by guano, or other forcing manures, aided by suitable atmospheric condition, green or root-crops grow with extreme rapidity, animals often suffer illness or even death; and yet if that same food be brought home, cut into short lengths, and lie for some hours mixed with drier food, it may be given with perfect safety. I once lost 13 fine four-months-old calves by allowing them to help themselves in a field of fine rapidly-growing young Italian rye-grass, which my practical neighbours pronounced to be just the thing for them; and yet they were receiving other dry food. Previous to the turning in, those very animals were doing well, fed on the same grass when cut up into short lengths, and allowed partially to dry, and given to them in sheds.

There is evidently some satisfactory chemical change that takes place in the process of drying. In fact, we know the heaps of cut food soon ferment, and, unless spread out thinly, pass into the sour and unpalatable condition.

Even ordinary grass, turnips, and tares and clover have, from extreme succulency, proved dangerous, unless allowed to dry partially or wither.

I dare not sewage-irrigate the Italian rye-grass intended for my young lambs in the spring, experience having taught me that the extreme succulence kills them. They thrive admirably upon it when not so manured. It can never be too rank or too rich for mowing and making into hay. If properly got up with a green colour it surpasses any other hay in nutritive properties. Our hard-working horses give evidence of this fact when fed upon it.

One cause why succulent food is injurious is, decidedly, the quantity of water it contains. Fresh-drawn roots contain 90 per cent. of water. The remedy for this evil is clearly to allow the food to lose much of its water by drying. I have so many proofs of this from various practical farmers that there can be no doubt about it. In one case the mangels were pulled in hot September, and allowed to remain two days on the ground to wither. Sheep then folded on them went on admirably. In another case the mangel roots, early in the autumn, were pulled and allowed to shrink and shrivel in the shed—this was accidental, but as soon as the cattle were changed to fresh-drawn roots they went wrong. In another case of 500 breeding ewes on white turnips in full growth the ewes suffered and were removed to grass and

recovered, then again put on turnips and suffered loss. Ultimately the turnips were picked up and allowed to remain three to four days before consumption, and then the ewes were healthy. All this proves that the diminution of water by evaporation is an advantage gained; possibly some chemical change may take place in the juices of the roots. It does seem unreasonable that a bullock eating 150 lb. of roots daily should be thus compelled to take 13½ gallons of water with only 15 lb. of dry matter. The same remark applies to sheep.

A neighbour tells me that his male fattening sheep are doing well on mangel and linseed cake, although they were not healthy on mangel and cotton cake.

Roots, and especially mangel, when pulped, lose much of their water or juice by drainage. By mixing them with plenty of very fine-cut dry chaff, the juices are absorbed, and the proportion of dry substance to water is advantageously increased.

But while I warn you against over-succulent food, beware of the other extreme. When tares and clover are far advanced in growth and maturity, they become dry and tough; it is then essential to have them passed through the chaff-cutter, and when so finely divided they are more accessible to the gastric juices, and less likely to produce windy swelling and inflammation.

I know some very large farmers who, as a source of profit, have their horse-work chaff-cutter in the field, and pass all their sheep food, even grass, through it, for their large flocks of sheep: they find it profitable. I cut up and comminute and intermix every kind of food, and grind the corn, especially for horses. Although I had at first great doubts, I have convinced myself unmistakably that a small quantity of condimental food hastens the fattening of cattle, especially young ones, which are generally more difficult to fatten. I sell my young short-horns sufficiently fat at 21 months at about £20 to £22 each.

I consider my success in the management of stock, and my getting a good return for my root and green crops, attributable to my cutting the green food into short lengths, and mixing it with plenty of very fine-cut straw-chaff, some meal, some cake, and a small portion of malt-combs and bran, also 1 lb. of crushed linseed daily.

In winter this food is administered in a warm state, the *waste steam* from the engine giving us heat and hot water *without cost.* The roots are pulped, and the whole mass

mixed up together in the great coppers, or rather cheap cast-iron tubs. The difference between warm and cold food in winter is soon seen in the condition of the animals.

Let me advise you to look upon straw as a profitable feeding stuff, especially wheat and bean-straw; the latter, when passed through the chaff-cutter and then moistened with hot water, becomes soft and mucilaginous, and is worth two-thirds the price of hay. Bean-straw, as long and as hard as walking-sticks becomes, by hot-water moistening, soft, and is eaten greedily by our animals; it is better than any other straw: all mine is eaten. Wheat-straw stands next in value to bean-straw, but then you must cut it very fine, say one-eighth of an inch. I presume you all use steam-power. Not to do so on a farm of 200, or even 150 acres, is a great commercial mistake. I will not now go on to explain all its advantages. I recommend you to use a Cornish boiler for a fixed engine.

Without my engine, which I have had for 18 years, I should be, agriculturally, "nowhere." It grinds corn, breaks cake, pulps and cuts up roots, threshes and dresses corn, raises sacks, pumps water and irrigates, and cuts chaff. We really must intensify our farming in these progressive times.

Some of my bullocks are on sparred floors, others on cut straw and paved floors, all under cover and properly sheltered. Although there has been "plague" all around me, I am thankful that at present mine have escaped. Let me particularly call your attention to

PROPER VENTILATION.

The want of this is the fruitful source of disease. It is annoying to me to see new buildings erected without any opening above the animals. In my case, immediately under the wall-plate, at intervals of about 6 feet, some bricks are left out, giving openings of about 9 inches by 6 on each side of the building, and at least 7 to 9 feet from the ground, so as to let the ventilation be some distance (about 3 to 5 feet) above the animals. In the roof there should be louvre boards or openings with a vertical divisional pendent board, 3 feet deep, dividing the openings, and causing circulation.

In the case of milch-cows the opening should extend far along the roof, as they require more air than fattening animals. To give you an idea of the utility of this, and of *the openings under the* wall-plate, you may smell the impure *odours coming through* them at many yards' distance,

showing how injurious it must be to keep those poisonous gases in constant contact with the animals where there is no escape for them. The manure is only removed from under my bullocks about once a month or six weeks, according to weather; in cold weather it may remain a long time. It would never do to keep animals on long straw, or to over-litter them, because then air would be admitted, and you would have fermentation, which would destroy your animals. By cutting straw into short lengths, and littering sparingly and evenly (on a paved floor, of course), the whole mixes up into a hodge-podge or paste, no heating takes place, the animal is kept clean, and the manure is at once ready to take direct to the field for immediate use. You can keep animals much cleaner on short-cut straw than on long straw, because the former absorbs at once all moisture. The long straw, with its glassy outside, cannot do so until broken up.

PROFIT OF SHELTER.

Shelter is so important as a source of profit, and can be so cheaply extemporized where it is not convenient to put up permanent buildings, that I must say a word about it.

A few rough poles and some straw and bushes will, with a few shillings' worth of labour, give you a thatched shed and yard for 100 sheep for less than 9*d.* a sheep, and will last four or five years, or about 2*d.* per sheep per annum.

My plan is to let them run out in the daytime in winter on a pasture, and shut them up at night. Just imagine the comfort of lying on a dry bed under cover for some 14 or 15 hours, instead of on cold, wet grass, or clay, with wet fleeces from pelting rain or sleet, white frosts, &c. It is an immense and unprofitable mistake to allow such things. I cannot afford to do so; and although certain people may laugh at my farming, I managed to make this past year, at low prices, 12 per cent. on my farming capital, after paying myself the high improved rent of 40*s.* per acre. I don't expect everybody to believe this, but rather the contrary; but at all events facts are stubborn things, and a clear conscience is a sufficient support.

Much of the poverty of farming is caused by the want of care and comfort of live stock. Animals are, like ourselves, keenly sensitive to atmospheric influences. In a cold evening *they will at once* get under the shed; when warmer, they *choose the open* yard. I have now a number of very old *ewes that have* produced equal to one lamb and a half each—

fine lambs. By sheltering the old folks with their lambs at night, and immediately after parturition, we have not lost a single lamb, and by good feeding shall, as we did last year, get probably over 40*s*. for them before summer is out.

SHOULD WE BREED OR SHOULD WE BUY OUR STOCK?

I am decidedly of opinion that we should breed at any rate a portion of our stock, especially sheep. By the enclosure of common, waste, and breaking up of grass lands, we are annually diminishing our rough breeding-ground. Many breeders now fatten their own stock, and thus prices for lean stock are so high as to trench upon the feeder's profit. Animals reared at home, and well fed from their birth, are altogether more hardy and more profitable, because less risky than those we buy in. I find no difficulty in breeding on an arable farm—a few acres of pasture, some extemporized sheds, and covered yards at the homestead. In every way I consider it more profitable than buying in. I need hardly comment upon the necessity for a good male parent especially, as well as well-bred mothers. I like cross-breeds for sale, but not for breeding.

There is, in my opinion, one point in cattle-feeding which I think has hitherto escaped observation; and that is, the "cause of the increase of lung complaint or pleuro-pneumonia." Although it may occasionally arise from cold, my view is that it is often caused by another very obvious means. We purchase lean animals, often mere skin and bone, especially Irish, which have been from their birth but poorly fed; consequently their blood is thin, watery, and pale, and the blood-vessels small and contracted. In our attempts to fatten them quickly, we administer good rich food; the blood thickens and increases in volume, and demands more space for circulation. In passing through the millions of fine vessels in the lungs, obstruction takes place, producing irritation, short cough, inflammation, and ultimately suppuration and death. The importance of a free circulation of the blood may be estimated by the fact that in the human frame from 31,000 to 38,000 lb. of blood pass through the heart and capillaries every twenty-four hours—although the actual weight of blood in the body may be only 31 to 38 lb. In a full-grown bullock, nine or ten times the weight of a man, the quantity of blood passing through the heart and capillaries *daily must be* 300,000 lb. or 134 tons daily. I am led *to make these* remarks from observing that when very lean

animals are brought on to poor badly-farmed lands and scanty herbage, they generally keep healthy, although their improvement is very gradual. Indeed, on the poor heath close to me I have constant evidence that mere ragged skeletons of animals, picked up as odd unsaleable lots at a cheap rate at the tail of a market, wander about the heath and roads for a considerable time, and ultimately they very slowly pick up a little condition and grow and improve sufficiently to become useful. One very seldom hears of lung-complaint among them, although exposed to the cold blasts of winter and tormenting flies of summer.

They are brought home to a yard at night. It seems as if you could not kill them, however much you may pity them. How careful then should we be in graduating the supply of food to animals in such a condition. Should we not so deal with a human being almost skeletonized by starvation? Certainly by very slow and cautious supplies of suitable food. The rule holds equally good for cattle, sheep, and farm animals generally.

How different the circumstances of an animal well fed from the day of its birth. Such an animal will "stand" any amount of good food, and will be larger and weigh more at two years old than the other at three years.

It is thus easy to understand why good high feeders who desire rich manure and a quick return purchase well-kept and high-fed animals half or three-quarters fat. They "go in" for finishing up, and as my friend Hudson and other good Norfolk men say, "We begin them with 5 lb. of oilcake daily, and get them on to 10, 15, and ultimately 20 lb. per day, with all the roots they like to eat, and in addition meal and hay"—in fact, all they can eat, to make them "ripe." Fat beasts make fat crops, and lean beasts make lean crops.

In certain poorly farmed districts the natives may well be astonished that our Norfolk friends do this as a source of profit; but so it unmistakably is; therefore I say, "Go and do likewise."

It is important not to overfeed animals in a state of confinement without exercise; they are then in an unnatural condition. If, therefore, there is any indication of loathing food, immediately stop the supplies, taking care, however, that they have free access to water. Empty mangers are as essentially necessary as full ones. A well-cleared plate *indicates a good* appetite, and a not more than sufficient *supply of food.* I am often made angry by my ploughmen, *who will persist in* feeding their horses even more abundantly

when, from weather or other causes, they are not at work. Nothing will endanger a horse's health or our own more than absence of exercise and rich feeding. A sagacious old friend of mine, who only uses his pony occasionally, takes care to put him on short commons when not at work, and keeps him thus in good health.

A dose of salts or cold shower-bath in hot weather will stimulate the appetite. When I fattened many hogs in hot weather on sparred floors, an occasional shower-bath from the irrigating jet would cause a clearing of the bowels, a cooling of the system, and a cleansing of the skin that prevented fever and gave them good appetites, although then very fat. These remarks would apply forcibly to many obese human beings. I need not apologize for thus enlarging on the feeding question, because it is essential to the turning to good account our root and green crops.

I object to undue confinement for breeding animals, male or (more particularly) females.

For eighteen years one of my sheds, having sparred floors, has been used by various lots of bullocks, and we have been struck by their usual and uniform sanitary condition. The secret is those spars give much exercise to the tendons and sinews of the whole system by the hoofs opening or expanding.

It largely develops the bone and muscle, and, in fact, if pigs are put on when large, it gives them capped hocks. Sheep on sparred floors do well, for they too thus get exercise. When very concentrated rich food is given alone to animals in confinement, they can only endure it for a short period. Poultry fed on rich barley-meal or suet become fat in about a fortnight, but don't go on after that. The necessity for mixing hay or straw with our cattle food is obviously necessary as well as advantageous.

We must deal differently with adult or growing animals,—giving to the latter bone and muscle-making substance.

I know some very keen farmers who in October pay 40*s.* to 50*s.* each for lambs at the great sheep fairs to carry on. Many of these are fit for the butcher, but they find it ultimately cheaper and more suited for their high feeding than lean half-starved animals at a low price.

I would say, in conclusion, especially to those who farm poor lands, and are young beginners, cultivate deeply, keep down weeds, manure abundantly, and produce that manure as much *as possible at home* by a larger consumption of the *crops you grow, aided* by oleaginous cakes.

To make the most of your roots and green crops it is essential that the bulk of your straw should be finely comminuted, and consumed with those roots and green crops. Keep your animals warm and dry in winter, and cool in summer. When agriculturists increase in intelligence and scientific knowledge, farmers will use coal instead of food for the production of animal heat, and will consider ventilating-shafts or openings in the roofs of their cattle-sheds and stables an essential item in farm profit; washed manure will then be an exception, and not, as now, a rule.

Wherever the sewage of towns can be brought on to the land, green crops and grasses thrive abundantly, especially the rapidly-growing Italian rye-grass, and various strong-growing grasses. A great many towns are now pouring their sewage over grass lands, instead of wasting it by poisoning our rivers. Our Legislature will, no doubt, in due time, make it penal to pollute our rivers; this will compel town corporations to act upon the reasonable conclusion that the only true and remunerative deodorizer is the soil.

THE WAR WITH WEEDS.

THE hoe is "the farmer's friend"—the weeds his enemies. Let any one who doubts this take a survey of our corn-fields at this particular moment, and he will soon be convinced. Surely there never was such a growth of weeds as this year. A very wet and mild winter appears almost to have created them; and where the hoe has been neglected, they choke and top the corn, and will diminish the wheat crop to an extent that may well alarm us. It appears to have rained docks, thistles, black grass, charlock, "hard hack," and a number of other "corn enemies." Clovers, like wheat, a poor crop, are sadly infested. A wet spring prevented the usual early hoeing, and has thrown the work "all of a heap." Even with the use of Garrett's horse hoe and a resolute force of hand hoers, I have only just been able to master my enemies. Where there has been neglect or a false economy in this matter of hoeing, I see very disastrous results. Even though thus late, much per acre is paid for hoeing; labour, too, is dear and scarce. Formerly women for weeding *abounded at* 8*d.* per day; now they are not to be had, for *trouser-making* at 1*s.* per pair pays them much better, *and just now* hundreds in this neighbourhood are more pro-

fitably engaged in picking peas for the London market. Railways have enabled us to raise a supply for the Londoners. When I was in Londonderry, I found that there, and among the mountains of Donegal, a supply of shirts was made for the good folks of London; thanks to the rail, steam, and penny postage. Altogether I do not see a good prospect this year for the poor stiff clay farmer, especially as regards wheat and clover. Grass, too, is light, and expenses heavy. Wool is following "King Cotton" in his descent from his throne. Our harvest cannot be a very early one. We have, however, one comfort, and that is, "dear meat."—*June* 13.

P.S.—Those who have this spring omitted to hoe out the weeds from their clover and grass fields will find a sad diminution in the quality and quantity of their hay crop.

FARM PROFITS.

THERE is one important point upon which the majority of farmers and myself have never agreed, and probably never will agree, and that is whether my farming pays a profit on the farm capital invested. Of course many landlords, taking their cue from their tenants, think as they do. I make no complaint of this. On the other hand, there is a comparatively small but most important agricultural minority who know and admit that my farming does pay—in fact, that it must pay, judging from the soundness of the theories upon which it is based. This minority is composed of practical men—intelligent, inquiring, honest, and calculating—who throw aside antiquated prejudices, and seek for and rely upon obvious and visible results: men who test theories by comparative experiments on a sufficient but uninjurious scale, and thus verify or disprove them. I do not expect my statements of facts to be believed by the general mass. It would be unreasonable to do so, because I know that many, who would not impute falsehood to me, believe that I am deceived by my men or my bailiff, and that I am personally ignorant of the true state of the case. They do not, or will not, believe that for more than twenty-five years I have watched closely every operation in agriculture, with a view to compare various practices, and thus deduce a preferable and correct result. In *fact, I may safely* say that I have done so for forty years, *but most practically* during the last twenty-five years. While

I have done this, I have also endeavoured to discover and trace the *causes* of successful results; and here I must pay my tribute of respect, admiration, and gratitude to those men of science who have for the first time illuminated the hitherto dark path of agricultural progress, and prevented that unprofitable stumbling which has cast away millions of agricultural capital in needless and fruitless experiments.

But of what use is that bright light of science to those who will not avail themselves of it, but prefer the darkness of antiquated prejudices and local self-satisfaction? There is one very important reason why it is inconvenient to believe in agricultural amendment. Improvement in agriculture can only be carried out by an increased outlay of capital, or, failing that, by a considerable diminution in the extent of holding either as landlord or tenant. The pride of proprietorship rebels against the diminution of area, and the same feeling, aided by doubts as to the profit of increased investments, acts in degree upon the tenant. Besides, there is nothing, as a rule, more undefined and various than the most profitable amount of acreable capital required for profitable farming. Both landlords and tenants are quite "at sea" on this subject, and yet this is perhaps one of the most vital questions affecting profit.

It is not at all uncommon for poor farms in poor neighbourhoods to be taken with a capital of £2 or less per acre, and I believe that the average capital of the United Kingdom is under £4 per acre. The result is a miserable gross produce of probably £3. 12*s*. per acre.

How can such tenants compete successfully with others investing from £9 to £15 per acre on the same description of soil, and getting a gross return of £10 to £12? The rent, tithes, rates, seed, horse-labour and manual labour become increased on the small investment 50 to 100 per cent. The result is a gradual wasting away of capital, the poverty of the tenants reacting on the landlord, and causing diminished rents; for we know that low rents and bad farming generally go hand in hand.

I see so many instances where this over-holding and diminutive produce absorb the tenant's capital, and send him to the world penniless, that it is quite afflicting. A bad season, like the present, upon a poor, unimproved, and ill-farmed heavy clay farm, will mulct the tenant of 20*s*. to 40*s*. per acre. I know in one case near me, that in 1861 and 1862 the tenant *lost £1,500 on* 300 acres in two years' holding, and quitted *his farm a ruined* man.

I may in some future paper trace the causes of loss to noblemen and gentlemen who attempt to farm their own land, and cannot make it pay. The production of maximum crops must be our sheet-anchor. These can only be produced by a sufficiency of capital and practical knowledge.

Recent statistics have shown that we have (in cattle, sheep, and pigs, reduced to sheep) only about one sheep per acre that is also the manure of one sheep per acre — in the United Kingdom. Can we, then, wonder at the smallness of the crops, or the necessity for foreign imports of meat and bread?

We have no statistics of poultry; but it is evidently equally as deficient as our meat supply—for we import *daily* from abroad one million of eggs!

The quantity of corn we produce is evidently dependent on the quantity of meat we make, for the farmer who increases his meat production will in the same ratio increase his supply of manure—the one thing wanting to increase our, at present, small crops of grain.

Where water and manure are available, the advantages of irrigation by hose and jet are too apparent to admit of a doubt or question. On the 31st. of May I carted 15 tons of fine Italian rye-grass hay, the produce of 5 acres, producing a value of £14 to £15 per acre, from poor land. This very field produced a crop of barley last year.

After again irrigating, some portion of the field which was mowed earlier for soiling has again thrown up a crop nearly a yard high, and yet there are people to be found who say this will not pay!

The fact is that much of the odium of sewage-irrigation has arisen from bungling machinery, ill arranged and miscalculated.

For six long days of twelve working hours our pumps have been putting on 120 gallons per minute of water, mixed with manure, salt, and about three-quarters of a ton of guano, at the following cost:—

Three tons of dust coal	£1	10	0
Cartage of ditto from Maldon	0	9	0
Engine-driver	0	15	0
Two men to hose and jet	1	10	0
	£4	4	0

A considerable amount of grinding, chaff-cutting, &c., was done, and *should go* in diminution of the above charge, and *against wear and tear* of machinery.

Quantity of land irrigated, 9½ acres.

Expenses as above	£4	4	0
¾ of a ton of Peruvian guano	10	0	0
Salt, 1 ton	1	4	0
	£15	8	0

So here is an expense of some 30*s.* per acre to produce at least 1 ton more of hay, worth £4 to £5. The contrast between the portions not irrigated that could not be reached by our jet, and those irrigated, should bring conviction to the most doubtful.

Our young cabbages, where irrigated, show to a line the advantage of irrigation.

On a great scale, with Cornish engines, the cost of irrigation would be greatly diminished. I am decidedly of opinion that the hose-and-jet distribution is to be preferred where there is not natural gravitation, or where water is scarce. It renders unnecessary the very heavy expense of levelling or preparing land.—*June* 13, 1866.

P.S.—No doubt some agriculturists are aware that it has been proved before the House of Commons Committee that 1,000 tons of sewage or water may be raised 300 feet at a cost of 13*s.* to 14*s.*

BENEFICIAL RESULTS OF DEEPER CULTIVATION BY TRENCH-PLOUGHING.

Baron Liebig very justly says that our hard or cold stiff heavy soils, although chemically fertile, are physical barren, owing to the impediments offered to the free spreading of the roots—the absence, in fact, of friability. The cohesion of the particles is intense, especially after such a mild wet winter and spring. This is especially the case with undrained and shallow-ploughed clays. The only remedy for this physical disability is the ample introduction of farmyard manure by deep trench-ploughing. All this is best done in dry weather, when air is freely introduced between the rough and separated masses. One of the main causes of the bad wheat crops this year on cold stiff clays is the absence of hard winter frosts. The expansion of the frozen water in the clay shatters, loosens, and separates the particles, leaving it in *spring like an ash*-heap. The absence of any such frosts in *the past winter* has been a great calamity for heavy-land

farmers. In June last year, as fast as we cleared off our tare crop, the land was heavily manured and trench-ploughed, the ordinary plough going deeply with three horses, another plough, without the breast or mould-board, drawn by three strong horses, following in the track of the first plough, furrow by furrow. We then had a good crop of cabbage, and after the cabbage both the oats and barley promise well. The fact is that this breaking up of the subsoil facilitates the passage of air and water to the drains, and causes the crops to thrive in spite of weather. But ah! Mr. Mechi, does it pay? Well now, that is just the very thing it does do, and the absence of such deep cultivation is one principal cause of the wretched and weedy crops that meet the eye in every direction on the cold hungry clays. The longer I live, the more and more am I convinced that shallow cultivation is a radical and unprofitable error, entailing serious loss on British agriculture. I exempt, of course, from my remarks all loose and too friable soils, which rather require compression.—*June* 15, 1866.

ADVANTAGEOUS MODE OF GROWING WINTER TARES.

We usually drill with our two bushels of winter tares, half a peck each of winter oats and wheat, which help to keep the tares from becoming laid and rotten below. Our tares this year are grown on a barley stubble, where much barley shelled out. When the tares came up, they were crowded by the self-sown barley, which "stood," owing to the mild winter, and it was predicted that the crop of tares would be ruined by the barley. Quite the reverse of all this has happened. We have a fine crop of barley, tares, wheat, and oats, nearly four feet high, immensely thick and upstanding, but rolling heavily in the wind. The barley approaches ripeness, the wheat and and oats coming only into ear. The mass is cut, brought home, and passed through the chaff-cutter, giving such nutritious food (corn, straw, and green food combined), that although my horses are very hard worked by subsoiling and deep ploughing, they are in full flesh and condition, although they get nothing but this food. The cutting up fine is all-important, for without this half at least of the food would be uneaten. The cost of mowing and cutting up

by hand is 8*d.* per horse per week; by steam-power 1½*d.* per horse per week. In either case it pays well. I must be permitted to condemn most severely, as a very unprofitable practice, the usual mode of giving long uncut food to horses or cattle. The contrast in the condition of the animals so treated is striking and convincing. I ought to say that the tares are supported vertically, and are now in flower, overtopping the wheat and barley. Every portion is available as food, instead of rotting on the ground. After tares we manure heavily, trench-plough deeply, and get an abundant cabbage crop, followed in the spring by a full crop of oats or barley.—*June* 15, 1866. What a contrast these tares present when compared with the light crops of upland grass.

OUR COAL, FOOD, AND POPULATION IN 1966.

According to Mr. Jevons' estimates, our present consumption of coal (100 millions of tons annually) will be increased in 1966 to 3,000 millions of tons, or thirtyfold larger than at present. This calculation implies that the necessary human labour in connection with the getting, distributing, and use of this enormously increased quantity shall be forthcoming when required. Will any of your readers kindly give me an estimate of how many of our population are now thus employed? I am induced to ask this question because, according to reliable statistics, our population in 1966 will bear no relative proportion to the increase of coal predicted by Mr. Jevons, and it is singular that in the anxious legislatorial debate on this important subject no allusion was made to our probable population in 1966.

If I am right in my estimate, the population of the United Kingdom in 1966 will have only increased one time, or become doubled, while our coal is to be increased thirty times! Can this be so? I think not. The consumption of coal annually in London is about five million tons. If our London population should be double in 1966, would the consumption exceed 10 to 15 million tons? If it increased thirty times (Mr. Jevons' calculation), it would be 150 million tons. What an enormous increase of railroads and their accompaniments is implied by this increase alone. I am no believer in it, for it naturally implies that our shipping, railways, &c., should all likewise increase in *due proportion.*

According to Mr. Jevons, the present rate of growth in the production of coal is 3½ per cent. per annum. This, judging from the past, is an increasing rate of increase; not so with our population—that is a decreasing rate of increase. For instance, the annual rate of increase of population for England and Wales in the years 1841 to 1851 was 1·221 per cent.; 1851 to 1861, 1·131 per cent. The estimated population of England and Wales for 1966 is 38,015,462, or only an increase of one time, while our coal increase is estimated at thirty times. Surely there must be some discrepancy here, probably some over-estimate of our future coal consumption, or some under-estimate of our increase of population, although the latter is calculated from a very reliable source. I hope this subject will be well ventilated in your columns.

Great anxiety is expressed about our future supply of coal, but none as to our food. When I express my surprise at this, I am told, "Oh, but we can always buy our food from foreigners." I reply, "And so you can coal." "But it won't answer our purpose to buy coal. We want cheap coal."

Well, but don't you want cheap food? and cannot cheap food be produced in Great Britain? I maintain that it can, provided you take the same means to produce it as you do to produce more cheap coal. That is by the investment of more labour, capital, and intelligence. Not that I expect that this will be rapidly done. Agriculture is too much shackled and trammelled by a variety of sentiments and circumstances to rank with trade, manufacture, and commerce, in material progress; but it may be useful to point to its shortcomings, and to stimulate to a more profitable state of things. I don't believe landowners or farmers are at all agreed as to the most profitable acreable capital to be invested by each of those interests to secure a cheap and profitable result.

Before Mr. Jevons' anticipations of an increased coal supply can be realized, untold millions of new capital must be invested in mine-sinking and machinery. So it ought to be with the production of our food; that cannot be increased without a considerable addition of invested capital on the part of landowners and tenants. What greater proof do we need than that, because we do not produce enough, the foreigner steps in to fill up the deficiency?

If as *much food* were produced generally in this kingdom *as on my poor farm*, and many others that I could name,

we could not consume one half of it. This is no exaggeration; but then in my case, and in many others, the capital employed is three and a half to four times as great as the general average of the kingdom, and I repeat that it is mainly by the investment of a great additional capital in agriculture that we can hope to be able to feed our population abundantly and cheaply.

If this is true, then, remove all obstacles and make the road free and open, so that capital may be tempted and invited to come that way. But what a vast field is that of agricultural investment on the part of landlord and tenant! The paltry increase of capital to the extent of £1 per acre would amount to £60,000,000, while really there is scope for from ten to twenty times that amount. The whole animal capital of the kingdom is only equal to one sheep per acre. An additional sheep per acre would add about £120,000,000 to the farmers' capital.

When dealing with sixty millions of acres, every investment presents a gigantic total. It is easy to talk about £5 an acre for drainage, £2 per acre for a steam plough, £1 per acre for guano, £5 to £6 per acre for covered yards, and no end of money for many other improvements, to say nothing of a readjustment of the forms of our farms, with a view to a business-like and profitable result. The task is a herculean one, and much of the land must pass into other hands, or become subject to new conditions ere the necessary funds for agricultural amendment could be forthcoming.

How can the farmer with £4 an acre capital (the average of the kingdom) compete successfully with the Norfolk or Lincolnshire or other good farmers who invest £16 per acre capital? The result of such competition is a silent absorption of means, or an infliction of pinching poverty. The same commercial law of supply and demand acts in corn as in cotton, or any other merchandise.

We do not produce enough food for our population. The foreigner steps in and fills up the deficiency. In a superabundant harvest he sends us little; in a defective one we get from him large supplies. It is because we do not produce enough that he supplies us. We could produce more than enough if we chose to invest in food-production a more ample capital and intelligence. We have plenty of both at command. I reiterate that it is a gross *national* error to loan our enormous profits to every poor *foreign potentate* when capital is required at home for the *production of* our food and employment of our labour.

How to bring it to bear, to tempt it and encourage it to flow to agriculture, is a question worthy the attention of all well-wishers to their country. It is certain that the more difficult it is to transfer land, the less prospect there is of its changing hands or receiving the fertilizing influence of capital and intelligence.

I was very much struck with a statement made to me by a most intelligent American, a member of their Parliament, who said, "We have merely to walk into our county register office, and in less than an hour we know all about the land we wish to buy. As to mortgages or incumbrances, the buyer and seller appear, make the proper transfer, &c., and the whole thing is at once settled at an insignificant cost." So it is with our own public funds, where comfortable book-keepers arrange the matter between buyer and seller in a few minutes. The stockbroker charges 2*s.* 6*d.* per £100; in transferring land we pay £2. 10*s.* per £100, and in addition a delay often of many months.

I must leave it to our longheads to arrange how all this is to be altered, which it certainly must be ere capital will abound in agriculture for the production of cheap and abundant food.—*August* 3, 1866.

"While other countries mostly subsist upon the annual and ceaseless income of the harvest, we are drawing more and more upon a capital which yields no annual interest, but once turned to light and heat and force, is gone for ever into space."—*Jevons*, p. 332.

"A farm, however far pushed, will under proper cultivation continue to yield for ever a constant crop. But in a mine there is no reproduction, and the produce, once pushed to the utmost, will soon begin to fail, and sink towards zero.

"So far, then, as our wealth and progress depend upon the superior command of coal, we must not only stop, we must go back."—*Jevons*, p. 178.

SINCE writing my last paper, "On our Coal, Food, and Population in 1966," I have been reading attentively Mr. Jevons' admirable book, which contains such a valuable, concise, but comprehensive summary of statistical facts bearing upon and arising out of our social and industrial condition, that I commend it for general perusal.

From that clear-headed writer I quote the extracts that head this paper. The more one reflects on the general condition of British agriculture as compared with our other *industrial occupations*, the more one is struck with the un-

favourable contrast that it presents, and the public indifference regarding it. Year by year we become more and more dependent upon foreign imports of food, while in an exactly opposite ratio, we are saturating the whole world with our other productions and manufactures. The causes of this unfortunate discrepancy are clear and obvious. In one case we employ an enormous increase of labour and capital, in the other a decrease of both; for I believe that very much capital is annually lost by our inefficient and therefore unprofitable mode of farming and land-holding.

In our agricultural counties population has almost stood still, and in some counties actually decreased during the last ten years; whereas in the manufacturing counties the increase of population is for the same period 20 to 23 per cent., and in manufacturing towns 26 per cent. Our manufacturing population has more than quadrupled itself in 60 years; it has multiplied at a rate equivalent to doubling in 28 years. Now it is quite clear that a proportionate investment of capital and enterprise must have also taken place, and that poor and inert agriculture has made little comparative progress. I admit that the introduction of machinery in agriculture may have displaced some portion of human labour, but that is but a small matter. In my own case, at Tiptree, with abundant machinery and steam-power, the increase of labour has been 100 per cent., or from 22*s.* to 44*s.* per acre. If to this be added the extra labour used in the original improvements, such as removal of fences, drainage, improved roads, new buildings, digging tanks, burning earth, &c., the population, in connection with agriculture, must have concurrently and greatly increased, and it has done so hereabout.

The general, social, moral, and physical condition of the labourer has amended; our new village church and new dissenting chapel are filled by well-dressed and orderly congregations: new cottages are erected, and the evidences of increased comfort as well as of increased population are various and unmistakable. The new village school is well attended by the juvenile labouring population. Can anybody, then, deny the benefits thus resulting to the country at large from such investments of new capital in agriculture?

What has taken place in this respect of labour in my neighbourhood has likewise occurred in all other similar cases of agricultural improvements.

One great drawback to landowners is the difficulty of *finding tenants* who believe that a capital of £14 per acre

will bring them a larger per-centage of profit on their capital than an acreable investment of half or one-third of that amount. The general farm capital of the United Kingdom being only £4 per acre, it follows that our amount of food-production must be miserably insufficient.

The population of England and Wales was in 1570, 4,160,321; 1670, 5,773,646; 1701 to 1750, about 6,000,000; 1801, 9,192,810; 1831, 14,070,681; 1861, 20,281,587.

As we have about 60 million acres (landlords' measure) in the United Kingdom available for agriculture, importations of food were formerly unnecessary, and we were exporters of corn; but now all this is changed. Our acres do not multiply, so that our population, owing to the miserably low production from those acres, require and consume the produce of probably some 30 millions of foreign acres. In other words, three acres (landlords' measure) are required for each man, woman, and child in the United Kingdom. With high farming, where abundant capital and labour are employed, one acre per head of population would suffice. The average acreable produce of the kingdom may be taken at £3. 12*s*. On some lands of average quality the produce is three times that amount—resulting from improvements effected by the landlord and tenants conjointly.

We must therefore conclude that, as compared with the enterprise of trade, commerce, and manufactures, agriculture is in a stagnant and non-progressive condition; that it neither employs sufficient capital or labour, and that consequently, in comparison with the other industrial occupations of the country, it is poor, penurious, and humble.

All this can only be remedied by a concentration of the present capital of landowners and farmers on a more limited area, and by much land passing into the hands of rich and enterprising purchasers and holders. The present landowners' capital I estimate at £1,500,000,000 (how much of this is on mortgage?), the farmers' capital about £240,000,000; both those amounts must be doubled or tripled ere we can satisfy abundantly and cheaply with our own produce John Bull's gastronomic requirements.

But where is the money to come from? I have not been able yet to ascertain the amount of our loans to foreign and needy potentates, but I fancy that the enormous total would go far towards accomplishing the objects I have indicated, to say nothing of our annual profits and accumulations, to the extent *of probably* near 100 millions.

I do hope that our agricultural friends will give up their

prejudices in regard to statistics, and then we shall have no longer to guess at the probable acreage and agricultural position of the country. Farmers must prepare themselves for a rise in the price, consequent upon the scarcity in the supply of labour. Labourers not only migrate to America and our colonies, but are attracted to our mines and manufactories by higher wages, and a facility of communication and transit. Persons employed in agriculture are decreasing annually. In 1861 they only numbered 1,924,110, while in other occupations they have vastly increased. The extensive use of agricultural machinery in the United States America is owing to the fact that the agricultural labourers always earned 4*s.* 2*d.* to 5*s.* per day, which, considering the low price of food there, was equal to 6*s.* or 7*s.* a day in this country.

Dear labour here will compel farmers to adopt machinery far more extensively than at present, and they will come to my conclusion, viz., "Never to use a man where a horse will do, and never use a horse where you can substitute steam-power."—*August* 22.

THE PECK OF WHEAT PER ACRE.

We have threshed the two half-acres, and the result is as follows:—

The peck per acre	.. ..	4¼ qrs. and ¼ peck per acre.*
The 4½ pecks per acre	.. ..	5 qrs. and 1 peck per acre.

Showing an advantage to the thicker sown of fully 4 bushels per acre. This is the third year of the experiment under like circumstances as to land and crop. In 1864 and 1865, the yield from the peck per acre was over 7 qrs. per acre, and the best on the field. This year we expected it also to be the best, and so it was on the lower part of the stitches, but they passed through some veins of light soil in the upper portion of the field, and there was both a deficiency of plant and branching, proving what we already knew, that wheat branches or tillers less on light than on heavy land, and is more subject to attacks by birds or insects. The time of sowing has also much to do with the success or failure of thin sowing. For instance, in both the previous years the corn was sown in October, the proper time with us. In the *present case* the sowing was early in November, owing to the

*The average yield of the whole field was only 4¼ qrs. per acre.

very wet October, and it is really surprising, looking to the lateness of the time of sowing and the miserably unfavourable season, that so large a crop as 36 bushels per acre should have been yielded from 1 peck, an increase in fact of 144 for 1, while the average increase of the country is only (according to Mr. Caird) 9 for 1. Climate as well as soil has much to do with the proper quantity of seed. Each man ought to experiment and judge for himself. Poor, half-starved farming does not promote tillering, while high farming stimulates it greatly. I am more and more convinced that the losses both in quality and quantity by excessive seeding are enormous, especially with barley, after a large crop of turnips fed off with cake. To sow 4 bushels per acre under such circumstances is a sad mistake as regards profit. The crop gets laid early, the weeds and growing clover shoot through it and draw it to the earth. The quantity of seed and period of sowing that would be proper in our south country, with its early harvest and high and dry temperature, would be egregiously wrong in the northern moister, colder, and later districts. As in the former trials, the wheat, both thick and thin, was put in the same day on a clover lea which had been mowed for hay and afterwards folded with sheep; the land in good forcing condition.

THE PRODUCE OF THE HARVEST

Is by no means equal to the estimate. So far as can be ascertained from the thatchers and travelling threshing machine owners, the yield is wofully short of the expectations formed, both on light and heavy land, but particularly the latter. There are yields both of barley and wheat of only 2 to 2½ quarters per acre. The thatchers say that their earnings will only be about half as much as last year. We hear of a good deal of straw and very little corn. My own crop will be much less than that of last year, which was a "bumper," for I had 40 acres of wheat that averaged 7 quarters per acre. A good deal of cut barley and oats, and clover, are being injured by the frequent and heavy rains. Turnips, mangel, and pastures are rapidly improving. —*Sept.* 5, 1866.

ON WHAT DOES THE VALUE OF A TON OF ROOTS DEPEND?

I REPLY, on the mode of their administration. We should never forget that every ton of roots contains about 9-10ths of a ton of water; consequently, that we give to the animal which consumes only roots nearly a gallon of water (10 lb.) with 1 lb. of dry matter. What would our groom say to this in our nag stable? "Gripes and purgation" would be his reply, especially if this water had a temperature nearly to the freezing-point. What a tax upon the urinary organs! These are the very means used in the hydropathic establishments at Malvern to reduce the bulk of some over-corpulent Alderman or *bon vivant;* whereas the object of every farmer, who wishes to see a profit, should be to increase bulk and prevent purging or diabetes. One can hardly wonder at the immense losses suffered in stock by "blowing" (windy flatulence) and scouring, caused by cold watery masses abstracting heat from the stomach and chilling and cramping its powers. Well may they rejoice in Thorley and other producers of stimulating and warming cattle food to counteract such mismanagement.

In wet and frosty weather, alternating, and a wet bed to lie upon, we cannot wonder that a thousand tons of turnips have hardly produced a cwt. of meat. Roots are food or physic, according to circumstances; therefore, as physic, we know they cannot conduce to the farmer's profit. The best estimators say, that with animals unsheltered it requires 150 lb. of turnips to make 1 lb. of mutton, or with shelter, 100 lb. to 1 lb. Now, as 1 lb. of mutton contains probably only ¼ of a lb. of dry matter, the rest being water, it follows that it takes 150 lb. of turnips to make ¼ lb. of dry substance in the pound of meat.

150 lb. of turnips contain 135 lb. of water (13½ gallons), and as our Scotch friends often give to their bullocks 150 lb. as a daily allowance, we can well understand how wisely they act in adding to this, dry straw. Let us make use of our pulpers and chaff-cutters to mix it all in due proportion according to temperature, &c. A certain amount of moisture is indispensable, seeing that our own bodies contain 76 per cent. of water, although our forefathers once believed that *we were all solid,* and that Harvey's theory of the circulation *of the blood* was a great error.

But to return to our turnips and their profitable conversion: it is quite clear to me, from long practice and observation, that we must by steam-power grind our corn into meal, break or grind our cake, cut our straw or hay mixed into fine short chaff (about one-eighth of an inch), pulp our roots, and so intermix the mass that it may suit the digestive organs, and thus be converted more profitably and with less risk to the animal's health.

If 1*d.* per lb. in the price of meat makes to some farmers a difference of £1,000 per annum, surely the same rule will hold good in regard to the cost of producing this meat, and the cost of a few tons of coals for the steam-engine can be of little comparative importance.

I know that many considered I was wrong and extravagant in advocating the use of a fixed engine on a farm of 170 acres; but if that farm is to produce, as it ought to do, and as mine of 170 acres does, 37,400 lb. of meat, and over 600 quarters of corn annually, and if much of that corn and cake, with abundance of roots, is to be properly prepared for the animal's stomach, there must be steam-power, millstones, chaff-cutters, pulpers, pumps, cake-breakers, threshing machine, &c. The farmer who makes 3 lb. of meat where his neighbour only makes 1 lb., produces, of necessity, three times as much manure as his neighbour, and must of course grow more of corn and everything else. Going to the barn door only for money is a poor affair, especially at present prices; we must look to corn and stock combined, and, if the latter is to return to us a good price for our root and green crops, the present generally rude and crude system must be changed. We must have paved and covered yards, straw cut up for litter, no dung-heaps, but rich unwashed manure carted at once to the land—a sort of fold in the dung-cart. When we consider that of the daily excrement of our animals 13 parts out of 14 are urine, and in that urine is all the *soluble* portion of the manure; that there is more dry matter in the urine than in the solid manure; and that this dry matter of the urine is worth £17. 4*s.* per ton, while the dry matter of the solid is only worth £4. 16*s.* (see Dr. Letheby's tables in my book, page 412)—well may the farmer prefer the sheep-fold to the open farm-yard manure, from the latter being so much wasted and washed away.

The success of the farmer is essentially a landlord's question, *for he is* sure to participate in a tenant's prosperity. *Therefore* I would say to purchasers of land—

Consider, before you buy, whether it may not be more profitable to you and your tenant to lay out some £20 an acre in drainage, buildings, machinery, &c., with a suitable residence for a farmer of capital, rather than to purchase a more extended estate, the purchase-money of which would leave nothing for landlord's improvements.

Tenants possessing capital are unwilling to take dilapidated farms with inferior residences, once suited to a primitive condition, which is fast giving way before a more advanced, intelligent, and wealthy race of agriculturists. If landlords desire to have first-class tenants, they must also take a new view of agriculture, and adapt their farms to modern practice and requirements. I know so many wealthy people who buy farms as a mere matter of investment, looking only at the present rentals, and then they complain that their tenants are backward, poor, and insufficiently capitalled. The acres of this country do not increase—on the contrary, the extension of towns and cities, railways and factories, is gradually limiting the agricultural area. The only thing possible is to vastly increase the produce of those acres, by intensifying agricultural practice. Landlord and tenant must co-operate in this necessary work. No end of money is wanted to do this; but will and belief are primarily necessary—then means will be found to obtain the capital. Every necessitous foreign potentate who chooses to pay a good per-centage to one of our leviathan city firms, gets from us his loan of millions, and repeats the operation when the market is favourable and money overflowing. In the mean time poor Agriculture makes no such effort, but with folded arms and melancholy mien stands bewailing her uncapitalled and helpless condition, too proud to ask and pay for that assistance which associated capital could confer, and has already conferred, on other interests which are more acute.

What might not be done for agriculture under the Limited Liability and Limited Partnership Acts? There is always plenty of land for sale in the markets. Individuals, in the absence of such companies, either decline to improve their purchases, or, for want of agricultural knowledge, blunder on to an unprofitable result. Companies, aided by talented advisers, of whom we have plenty of known good men, could purchase land, improve it, and thus derive a safe and permanent interest.

According to our talented friend Denton, we want 100 *millions or so to* drain our 20 millions of undrained acres, *and I could readily* point out a channel in the shape of

residences, covered yards, machinery, and a number of other necessary and profitable improvements, that would require and absorb some 200 to 300 millions more. But where is the money to come from? Was not the same question asked when railways were first proposed? and has it not come from somewhere to the extent of 400 millions!—daily increasing?

The fact is, farming is in its mere infancy, but the time is coming when, owing to that great man Liebig and other choice spirits, it will rank as a science and as a profession, unclouded by those dark mists of doubt, want of knowledge, and prejudice, which prevent its profitable development. Had companies such as I speak of existed, showing a good percentage, several of my millionnaire acquaintances would, I am convinced, have invested largely in them. There is nothing more certainly profitable than agricultural improvement.

The rent of land might thus be, in many instances, doubled, and the farmer's profit increased to 20*s.* or 23*s.* per acre, where now it is only half that amount, or even less, and in too many instances a loss of capital.

Money to any amount may be got on mortgage at 4 per cent.; but how can people invest in Agricultural Improvement Companies when none such exist?—I mean companies which purchase lands with their own capital, and invest their own capital in improving such lands. Under such companies, tenants with capital would be too happy to hold land having long leases, with the right to the game, and untrammelled politically. That is the way to bring into the agricultural arena a flood of tenant capital and intelligence.

I have gradually diverged from my ton of turnips, but, after all, the profitable consumption of them depends upon the questions I have mooted. It is of no use to talk to men about more stock, more machinery, and the other requisites for a more profitable meat and corn making. They say, "Look at these buildings; my landlord cannot or will not "help me and do his share. I would readily pay him 6 per "cent. for covered yards, &c., but he won't hear of it;" so that after all I may be excused for "spinning such a tough yarn" out of "On what does the value of a ton of roots depend?"

The importance of producing our own food abundantly and cheaply is, to my mind, a paramount question. Everybody is anxious about cotton; but if the question were put to the *British public* whether they would rather go without *their clothes* or their food for a month, I fancy corn would

carry the day against cotton. The ever-recurring appetite demands our best attention, and it is as great a mistake to buy our food from foreigners as to buy our clothing. That we have the means of producing the former with a profit by intelligent improvement I have long since been practically convinced. To lend our money to foreigners to enable them to compete with us in corn-growing instead of employing our people at home, is a great financial blunder. I am surprised that our sharp "getters up" of public companies in the City have not turned their attention to agriculture. I presume that they have tried, but found bucolic stolidity too much even for their powers of persuasion. It is not a slight rebuff that can repel their advances.—*Oct.* 5, 1866.

PARISH ROADS.

I SUPPOSE we are all agreed that the minimum of friction, jarring, and jolting is desirable as a matter of comfort and economy. Many an old vehicle and horse might last years longer on a level, well-made road, although they would soon come to grief when encountering the "jogs" and "jounces" of ill-made parochial roads, of which I am sorry to say there are still too many, even in my own neighbourhood. As turnpikes are now just abolished,* one naturally asks the question —are these excellent highways (now that they have passed into parochial management) to be assimilated to the ill-conditioned state of our local roads and byways? If so, road-travelling will be still further discouraged. There are several gross and flagrant errors and omissions in parish road management that demand our censure, especially as they are both costly and injurious to traffic.

For instance, a quantity of gravel is shot down and spread, but never again attended to in any way. Horses soon establish a smooth foothold in a deep middle furrow, and a smooth track on each side for the wheels forming two narrower furrows. As the animals very naturally avoid the intermediate ridges, we thus get three receptacles for water, with shoulders to prevent its running off the road; the consequence is a saturation which penetrates and softens the road; and thus we see these ruts and ridges remaining *until the road is* again mended, probably for a couple of

* In Essex and some other counties.

years or more, the intermediate ridges being scarcely worn. So a most important duty is neglected, viz., that of watching the road occasionally after the gravel is spread, and raking the young or newly-formed ridges into the nascent furrows, thus causing the horses to feel for a new footing, and by repeating the operation some half-dozen times, getting an evenly-worn surface, rounded, and highest in the middle, so that the water flows quickly to each side, thus leaving the road high and dry, the great point being to prevent water from stagnating on the surface.

Thus the road gains constantly in compactness and durability. A labourer with a common rake will regulate a long road at a very small cost. He should also be provided with a stone-hammer to break any large stones that will not bind, or that form bumps above the surface. These two important operations are most invariably omitted in most parishes, and consequently much inconvenience and loss result. Again, as to the time of road-mending, I have been annoyed a whole year by a quantity of loose stones being shot down in dry March and rolling about all summer, a portion of them finding their way into the adjoining ditches.

So long as parish road-mending is left to the caprice or crotchets of local and annually changing surveyors, we can hardly expect much improvement, for ideas vary from brickbats to stones picked from the fields, the latter varying from the size of cricket-balls to that of eggs; and as there is no raking or breaking, but merely a shooting down, it is easy to imagine the uncomfortable consequences. This is a great financial mistake, which insidiously abstracts from the farmer's pocket, through the medium of surveyor's rates, breakages, broken knees, and waste of power, a sum much greater than that required by a more perfect management, such as we see on our great public roads. It is a common thing to elect as surveyor a farmer who won't spend money; and thus neglect soon results in evidence of false economy; after a heavy shower, one can at once detect the weak places on a road. Little pools having no means of escape, except by soaking into and weakening the road, indicate the necessity for a few shovelfuls of gravel. I have seen the very worst management where the road runs up and down hill. Here it is of the utmost importance that the crown of the road should be kept highest, and that the rapidly gathering water should have means of escape into a ditch at intervals on the hill. Instead of this, and for want of a grating or two and pipes under the road, the rushing torrent roars down

to the bottom of the hill, or down the middle of the hollow road, carrying with it into the ditches cartloads of gravel from the torn and furrowed road.

There is one very important matter that should be observed and particularly attended to. However well made the road may be, grass will grow on its untrodden sides, and this grass has the power to raise the sides many inches in the course of a few years; and this is how it occurs:—Fine grasses of the cereal tribe require much silica; this silica is prepared for them from the pounded and aërated surface of the road, and carried to them by the road washings. Consequently these grasses multiply their roots to such an extent among the subterranean gravel, that the quantity of vegetation thus formed forces up the earth or sides of the road, and causes a high ridge, where before none existed, thus preventing the escape of water and injuring the road. This grass should be annually removed before it takes too strong a hold of the ground.

The growth of these ridges, forced up by subterranean vegetation, suggests many reflections. Antiquaries may no longer wonder at finding the architecture of ancient nations many feet below the surface. Vegetation has forced the earth above them, or engulfed them. Place any substance on a good grass field, and it will soon disappear; neglect your gravel walks for some years, and they will become a miniature pasture, with the gravel some depth beneath. Buildings are said to settle down in course of time, but it is really active vegetation, aided by worms, that swallows them up. The sides of roads are particularly encouraging to the growth of fine grasses, because of the amount of available silica and alkalies, and particularly because the grass thus placed enjoys a rainfall probably six times as great as ordinary grass; for all that falls on the bare road flows to the grass.

A practical farmer who visited me said he always manured his grass land with gravel from a pit, and it answered admirably. The gravel was soon "appropriated" by the grass, whose roots enveloped and embedded it.

Besides, there is always moisture under a stone in the hottest summer day, and thus the water is retained for the thirsty grass roots.

If you pull up a tiny plant of grass, growing in your gravel walk, after rains when the gravel is loose, you will be *astonished to* find what an immense bunch of roots it has *in proportion to* its surface-growth, and how much fine grit

it has appropriated and attached to those fibres. We can thus easily conclude what soils suit fine grasses. How soon a dressing of chalk lumps disappears from the surface, and in old grass pasture what a tangled web of fibrous roots arrest the rainfall, and appropriate much of it. It is this power of arresting surface water that prevents the immediate action of drains on coarse water-grass pastures. But as these are gradually superseded by a better class of grasses (the seeds of which should be sown), drainage will act more perfectly.

To return to our roads, let us hope that more counties will avail themselves of the new Act, by which local mismanagement give place to uniform and sensible action.—*Nov.* 5, 1866.

P.S.—Where roads have been long neglected, it is a good plan to pick up and sift the sides, and put the gravel in the middle of the road.

A certain farmer, when surveyor, used to fill the centre or foot furrow with gravel, which caused the horses to shift their track, still there was no raking or levelling.

ONE PECK OF WHEAT PER ACRE.

It does seem odd that the sowing of half a peck of seed on half an acre of poor heavy land should cause such a stir and make certain people so very uncomfortable. One would have thought that moderate experiments, in order to arrive at the most favoured result, would be approved and appreciated, and no doubt they are approved by many reasonable and unprejudiced men who desire to arrive at a sound conclusion.

But there are certain persons who will neither try the experiment themselves, nor believe those who do try it, and who even will not believe what they see. It is made a charge against thin sowing that my crops are so thick and full of straw at harvest time that they cannot have been produced from so small a quantity of seed, and yet this is the very object sought for in thin sowing.

Fifty-eight bushels of fine wheat, with $2\frac{3}{4}$ tons of straw from one peck of seed per acre (actual result in 1864), and nearly the same yield in 1865, may well astonish those whose over-seeded crops become, naturally, thin in harvest, *as compared with mine*, just as an overcrowded plantation, or an

insufficiently thinned crop of turnips, never arrives matured perfection.

There is nothing more easy than to detect at or be harvest the quantity of seed that has vegetated; the plants have thrown out numerous stems rising with a cu from a single crown, strong, reedy, glassy, and with l and broad ears and large kernels. The opposite of this takes place in a close growth of plants. The crow stems rising vertically are thin, flabby near the ground, easily beaten down by storms; the ears puny, and kernels small. With a small quantity of seed the c however heavy, may be bent down like an arch, but is n laid flat to the ground and injured like the thick sown.

The peck per acre has come up well, and when the su out the tiny plants show themselves at regular intervals, will (I should say from past experience) probably y equally or better than the rest of the field (11 acres); sti the uninitiated, it looks quite a failure when compared v the adjoining portions drilled with my usual quantity, bushel per acre. I always drill nine rows on 7 feet 4, wl is something over 9 inches from row to row, and as many years I have never deviated from this arrangem any bungler who denies this (forming his opinion from thick crop) must not be believed. The distance from ro row has been frequently measured by numerous farmers for the purpose of finding fault, but for their own informa or guidance. I have between 40 and 50 acres looking v and amply planted from one bushel of seed. Our dista cannot be less than 9 inches, because we always horse- between the rows with Garrett's horse-hoe, the hoes b 7 inches.

On heavy, drained, and well-farmed land in our eas counties a bushel of wheat is an ample sowing, and I much inclined to believe that two to three pecks would more remunerative. I am experimenting in order to sat my mind. I shall continue to endeavour to arrive at conclusions in spite of the sneers or jeers of persons wl motives are apparent, and whose mere opinions are not wo of notice. In the opposite scale I will place the reco approbation of hundreds of the most practical and estim agriculturists, British and foreign, who have formed t conclusions from practical observations. An advocat agricultural progress and amendment must naturally ex *some hard blows* from various quarters. Self-satis *non-improvers,* locked in agricultural prejudices and

quated practice, will never forgive me for causing a disturbance.

Some bailiffs are very jealous when their employers desire them to go and see Mr. Mechi's farm; their self-esteem is offended. Then there are over sanguine landlords who wish to see how they can increase their rentals without investment, and greedy tenants, who wish their landlords to do everything without receiving an interest for their outlay. But all this is natural, and I look upon it "more in sorrow than in anger," like Hamlet's ghost.

But these are the exceptions, and, as a rule, it is gratifying to me to know that my agricultural practice is watched and examined by worthy and intelligent agriculturists who rise above petty and unworthy considerations, and desire to benefit by any of my experiments that promise a favourable return.

As my farm has been thrown open for years to public inspection and has been visited by thousands of practical agriculturists, there is an open book in which those who run may read, and the peck an acre may be watched from the time of its puny birth to its ultimate ample development.

I maintain what I have often said—that it is a disgrace and an error and blunder that our annual produce should be only a quarter of an ear for each kernel.—*Dec.* 24, 1866.

P.S.—I have recently visited several retired parts of this county (Essex), and feel more than justified for what I have hitherto said about queer-shaped fields crowded with worthless Pollards—ill-arranged tumble-down buildings, absence of drainage, and a general unprofitability—for which the landowner is quite as much responsible as the tenant. It is a most uncommercial or unbusiness-like state of things.

LARGE CROPS OF WHEAT.

THE discussion about the peck of wheat per acre, the laughter and disbelief about seven quarters of white wheat, or eight quarters of revett wheat per imperial acre, present to my mind a painful sense of our national agricultural humiliation; because if those sneers and laughter are honest and genuine, it proves that small crops are the order of the *day, and that crops* such as I have described are very un-

common and produced at very great cost. I also come to be convinced that great corn crops cannot be grown by the ordinary thick sowing, and that this thick sowing is a national calamity, owing to its injuring and diminishing the crops. I know and expect that this statement of my honest conviction will raise a fresh storm of doubt and disbelief, but I will nevertheless calmly give my reasons for coming to such a conclusion; and, first, when I recommend high farming, I am very frequently told "that it is all very well for root and green crops, but that it won't do for corn, for we get our crops laid prematurely, and the quality and quantity are both injured if we farm so high." But it seems never to have occurred to such persons that the real cause of disaster in such cases is not too much manure, but too much seed. The roots of the thickly-sown plants, when the rootlets attempt to extend and ramify, meet with opponents having the same requirements; a grand battle ensues as to which shall have the greatest number of soil granules, and, as in all other battles, the weaker perish, and the victors are either crippled or injured. There can be no more mistake about this than about an over-thick or unthinned plantation, or a crop of unhoed and unsingled turnips. Liebig justly says that the greatest enemy to a wheat plant is another wheat plant, for the very obvious reason that they both require identical elements of food. Small heads and kernels and weak flabby straw are the natural consequences of this competition.

I never heard one of my own labourers say that I farmed too high for wheat. Well then, I assert confidently that one main cause of small grown crops is thick sowing, and that however rich your soil, you can rarely obtain a great crop with the usual quantities of seed sown. There are several awkward attempts at correcting this evil; first, by sowing late, and secondly, by "flagging" the wheat at certain periods of its growth. A money-making high farmer (an old friend of mine) who grows 400 acres of wheat annually, employs a whole gang of men in flagging all his wheat, and very often all his oats and barley. This is done when the broad or flag leaf is well grown in June, care being taken to avoid cutting into the sheath that contains the ear. He knows quite well that unless this were done, the crop would be prematurely laid and greatly injured. By this flagging the stem is relieved of weight, and stands more erect, the air and light *are thus admitted* to the lower portion of the stem, the over-*hanging canopy* of flags no longer shuts in the damp, and *no longer prevents* evaporation or causes mildew. All this

is rendered unnecessary by a more moderate quantity of seed. Let it be well understood that I lay down no fixed rule of quantity, but merely commend my brother farmers to try on a small scale comparative quantities, so as to arrive at conclusions suitable to their very various soils and climates. Now, when a man sneers or jibes at one peck of seed per acre on heavy land, or even at my general quantity of one bushel per imperial acre, I know at once that he has never tried it, and therefore knows nothing about it, having had or seen no experimental facts on which to form his opinion, and therefore, instead of being angry, I can only pity or regret the absence of a more sound mode of arriving at a just and safe conclusion. I plead guilty to being an agricultural disturber in this matter of thin sowing, and so long as I live and have my faculties I will continue to deprecate erroneous agricultural practice, with the sole and earnest view to benefit and elevate my country. But, eschewing motives, let us see what there is extraordinary in growing seven quarters of white wheat, and then from six to eight quarters of revett, on the same ground in two successive years, the land being poor, stiff heavy land, and the season suitable to such land, namely, plenty of sunshine and not too much moisture, such as 1864 and 1865. "Oh! but then you take wheat after wheat, Mr. Mechi, which we dare not do."

Let there be no misunderstanding about this. I know that many who make this remark and farm high, take barley after wheat, and get it of better quality as well, under their system of thick sowing, than taking it immediately after turnips fed off with cake. The land has less "branching" force after the removal of the wheat crop.

Now, although I take two wheat crops, the kinds differ almost as much as wheat and barley. I never attempt to take two glassy wheat crops in succession. I know that they would fail, because the silica is not dissolved in time for a second glassy crop; but, as a second crop, I take the pithy-strawed non-glassy bearded revett, which gives, on our stiff soil, a larger return than barley.

But then I am convinced by practical experiment that I should be unable to obtain seven or eight quarters from two or three bushels of seed, although I frequently do so from four pecks or even from one peck. These conclusions have been arrived at by careful experiment. For several years I tried one bushel of wheat per acre *against two bushels* of wheat per acre—both drilled. The *difference in favour* of the one bushel was equal to a rent of

30*s.* per acre. This settled the question so far as my heavy land was concerned; but every man must judge for himself, not by imagination, but by experiment. Whenever we hear of very great yields, it is generally from a very thin plant that was almost condemned to be ploughed up in the spring—a branching crop is almost always a good one; but thick sown cannot branch—there is no room or power for this. As to manuring, I keep plenty of live stock, and so make much manure.

I use two cwt. of Peruvian guano, mixed with one to two cwt. of salt as manure for wheat after beans, or roots drawn off, and also for revett wheat after white wheat. So much does a warm, dry summer benefit our heavy land, that in 1865 my 40 acres of heavy land wheat averaged seven quarters per acre—not farmers' acres, but really and correctly measured acres. After a crop of mangel I got seven quarters, and after beans, seven quarters five bushels of red wheat, and after seven quarters of white wheat, eight quarters of revett.

In conclusion, it must not be supposed that I recommend a general seeding or sowing of one peck an acre of wheat; but the success during three years of such a quantity proves that a great reduction in the absurd quantities usually sown may safely take place. A bushel an acre on my heavy land is more than is required, and leaves an ample margin for slug or other damage. The peck an acre has, however, in my case, surpassed the bushel in yield of corn and straw two years out of three.

My object is to induce agriculturists to try reasonable comparative experiments, which, as men of business, they are bound to do, and not rely upon antiquated quantities only suited to a state of things either long since passed away, or gradually changing. Broadcast quantities are not suited to modern drill culture.

That there is need for great amendment is clear when I am even now frequently told, "We always put in seven bushels of oats, four of barley, and three of wheat." Take heed to local measures, for at Carlisle some farmers told me, to my surprise, that they only put in a bushel of wheat, but I soon found that a Carlisle bushel is equal to three imperial bushels.

On very light land, where wheat does not usually branch freely, more seed is required, especially where subject to wireworm and frost. In this case plenty of salt, some rape-cake, and compression are more beneficial than too much seed. *Salt not* only removes wireworm, but protects the *roots against frost.*

I hope that another year, instead of silly sneers and misstatements, I may receive a list of carefully conducted experiments from various districts and differing soils; on poor miserably farmed, underdrained small fields, shut in by immense weed-growing hedges, and robbed by the roots of worthless pollards, a good crop can scarcely be expected, be the quantity of seed large or small. Unfortunately I know of too much such land.—*January* 1, 1867.

I take this opportunity of wishing many happy and prosperous years to my brother agriculturists. In our county wheats promise particularly well, and the land is altogether in a more fit condition than at the same period last year. Let us therefore hope for a good crop and a fair price.

ON THE CONDITION OF BRITISH AGRICULTURE AS REGARDS ITS PRACTICE AND ITS GENERAL POSITION TO OUR OTHER INDUSTRIAL OCCUPATIONS.

Given at the request of the Faringdon Farmers' Club, at their Library, in Faringdon, Berks, February 5, 1867.

THE subject upon which I propose remarking to-night is so large a one that I must confine myself to a consideration of a few of its most important parts, with a view to stimulate experiment, discussion, inquiry, and comparison. An unprejudiced inquirer, taking a general view of British agriculture as a whole, would naturally compare its condition with that of our other industrial occupations to see whether a due and proportionate amount of skill, capital, enterprise, and general intelligence characterizes its operations. Let us test this by comparative results. By the extensive use of costly steam-engines, complicated machinery, and scientific inventions and discoveries, and, by enormous investments of capital, every necessary of life (excepting food) has been increased in abundance, and greatly cheapened in cost. No such result has taken place in agricultural home production, for agriculture languishes in the trammels of *antiquated customs* and strong depressing influences.

AGRICULTURAL STATISTICS.

So far as our imperfect statistics of agricultural produce can be relied on, the evidence is that our produce has very slightly, or not at all, increased, and that, instead of having become cheaper, our meat, butter, cheese, and milk, have all greatly advanced in price. In spite of extensive areas of old pasture having been broken up and worked out with corn crops, we are dependent on foreigners for an average annual importation of 6,500,000 quarters of wheat alone (that quantity being increased this bad harvest to 8,000,000 quarters), while our average annual home-growth of wheat is only 12,000,000 quarters—12,000,000 quarters over an area of nearly 60,000,000 acres! Can anything that I may say add to the disgrace and humiliation of such a statistical fact, seeing that we are so overdone with surplus capital that our loans to foreign nations, independent of other foreign investments, may be probably 200 millions sterling, and that in home railways alone we have an investment of £500,000,000? Our natural production of wheat, at the average of 56*s.* per quarter, presents the ridiculously comparative sum of £34,000,000! This for the daily bread and annual feeding of 30 millions of people! On my poor farm of 170 acres the annual production of wheat is more than 250 quarters, and other grain in proportion; so that if the rest of the kingdom did its duty equally with my poor soil, our annual produce of wheat, instead of 12,000,000 quarters, might be 88,000,000 quarters. This is no comparative exaggeration, for of my 170 acres (landlords' measure), only 50 are annually in wheat.

Of course from the area of 60 millions of acres must be deducted the space occupied by our urban population in their towns and cities, and a large space for climate unsuitable to the growth of wheat; but, with the most liberal deduction, there is the evidence of my farm that profitably we could enormously increase the food of man and beast, were we inclined so to do, and call to our aid for this purpose an immense increase of capital and intelligence.

If I had any doubt as to the slow general progress of British agriculture, it would be removed by the census fact that our agricultural labour population is either stationary or decreasing. My experience has taught me that increased *produce cannot* be obtained without increased labour; for, *leaving out of* consideration the immense amount of labour

expended upon drainage and landlords' improvements, the current labour of my farm is doubled as compared with that used before the improvements, and this too in the face of steam-power, reapers, horse-hoes, &c.

Taking our production of wheat at 12 millions of quarters, it gives a trifle over 1½ bushel per acre over our 60 millions of acres. On my farm, over the whole area, 170 acres (landlord's measure), we have nearly 12 bushels per acre, and a proportionate increase of meat. I speak of my own farm reluctantly, and with no view to boasting, but am bound to quote it as an illustration, to show our national agricultural shortcomings.

Now, without any desire to find fault, I am bound in honesty to say that our general agriculture presents a most uncommercial and unbusiness-like appearance, both as regards landlords and tenants. I hope that no one will take this remark as applying individually or personally, for I know plenty of agriculturists who are a credit and honour to their country, and it is because I know this that I am, on public grounds, anxious that what is now the exception should hereafter become the rule. Many reasonable excuses may be found for our general backward agricultural condition. We are, as it were, only just emerging from feudalism—the days when the lord or landowner and his tenants and dependants had to fight together in mutual self-defence, and when each estate was a little kingdom, where the lord was somewhat of a Paterfamilias to his tenantry and their labourers, having and exercising an undeniable control over them. Under such circumstances, without roads, railroads, or canals, such a primitive and uncommercial condition could hardly surprise us; but all that is changed now; and although the natural goodwill and respect as between landlord and tenant should still exist, and, I believe, does so, still agriculture should now become a business, and requires to be treated on true commercial principles, if both landlord and tenant are to attain to a good pecuniary and social position. For see what is taking place elsewhere than in agriculture — merchants, traders, and manufacturers, free from antiquated prejudices, availing themselves largely of modern improvements and scientific discoveries, have thus realized princely fortunes, and by these means and this acquiescence in change and progress, are gradually becoming owners of some of the finest estates in the kingdom. As a natural consequence, they acquire very increased political influence. So long as *our estate owners*, actuated by a most kindly but mistaken

feeling, intrust their farms to retired superannuated ga keepers, or other menial dependants, and are content with unimproved rental in lieu of seeking for men of capital practical intelligent knowledge, so long will their esta present, as they do in too many instances, a melanch evidence of neglect and non-progression as compared w others where a different system has not only provided m ample food for the people, but has, concurrently, grea increased the rental and value of the estate.

My brother agriculturists must forgive me if I say t they, too, have a good deal to answer for. They have yet quite shaken off the mantle of old customs and prejudi and they are a good deal inclined to "snub" myself many like me who sincerely desire to see them in a m intelligent and (as a natural consequence) a more profita position. I know of so many cases where landlords, be willing to invest capital in the improvement of their la provided the tenants will pay a fair and proper interest such investments, have met with doubt, disbelief, and in f discouragement and non-acquiescence. In my own coun for instance, it is only after twenty years of hard fighting a discussion that some of my agricultural friends are beginn to believe that it is advantageous to drain those extens stiff, collapsing, unctuous tile earths which suffer so m from wet seasons. In fact it was only a few days ago tha wealthy landowner told me that his principal tenant declir to have his land of that quality drained, for the water w off quickly by the stetch furrows and water furrows. that landlord had gained a considerable sum by selling estate in another county after he had enlarged the fiel drained them, cleared away the timber, and erected pro buildings. I really ought to apologize for insisting here strongly on agricultural progress, seeing that in this v neighbourhood is one of the most bold and grand instan of change and progress that has ever graced an Engl estate; and I will venture to hope that if that estate w to be sold to-morrow it would realize a sum commensur with the improvement which has come over it since reclamation from a neglected condition. I feel that I am Berkshire, where the necessity for improvement is cheerfu accepted and acted upon. In confirmation of my opinion the advanced condition of Berkshire agriculture, I have o to refer to the following comparative statistical tables :—

	Poor-Law Board Return, 1854.	*Cattle Census*, 1866.
Cattle ..	14,024	39,149
Sheep ..	144,259	327,316
Pigs ..	24,888	41,265

The increase of live stock is a certain test of agricultural progress.

In this respect Berkshire stands pre-eminent; infinitely beyond many other counties. Can we forget that the good and lamented Prince Consort gave, by his example and patronage, an immense impetus to agricultural progress? I remember seeing, at Windsor, farm buildings and machinery that, for utility and economy, might be safely adopted by many a landlord and practical farmer. The late Mr. Pusey, Sir John Conroy, the present Earl Radnor, and many others in this country, have done much to increase the food of the people. There is a growing faith in drainage, deeper cultivation by steam-power, covered yards, less timber, enlarged fields, better roads, more manure and less seed, reaping and mowing machines, and better implements. All this is encouraging, and gives us hope of a better future.

Agriculturists begin to feel ashamed that they have for so long a time opposed statistical information, much to their own disadvantage. Public opinion, acting through our Legislature, has given to us a Government Registration Office for Land, so that a title once well proved will be no more endangered by the loss by fire or otherwise of some one or two old musty parchments, deeds, or wills. In that new but wonderful country, America, our intelligent cousins, who have still 1,000 millions of acres of maiden land to dispose of, have had them all carefully surveyed, measured, mapped, and registered in a proper Government Office (what an extent of country as compared with the 77 millions of acres of our United Kingdom!)

The cost of transferring land is in this country outrageously great, and the delay proportionate. I will illustrate it by a recent case that came under my observation. A farm, nearly all freehold, worth about £6,000, which had been occupied by the owner for more than twenty years, was mortgaged. The costs were £200, and the time occupied nearly three months. The same farm was transferred about two years later, and, although the former investigation of title had been most rigorous, again the process was gone through at an expense *of more than £200*, and another delay of three months.

Who would buy landed property? said a friend of mine, used to commercial and prompt transactions.

I am told, on reliable authority, that in any portion of the United States a property may be transferred or interchanged in a few hours at the local office, after proper notice has been given, at a mere nominal cost. It will take us a long time in this country to arrive at such a sensible mode of dealing with landed peoperty. It is generally acknowledged that facility of transfer or exchange would enhance the value of land 10 per cent., and no doubt, from changing hands occasionally, it would be more likely to undergo improvement.

AGRICULTURAL IMPROVEMENT.

We are also beginning to believe that it is as much to our advantage to well house our agricultural labourers as it is to well stable our farm horses. I believe statistics would show that more than three-fourths of all the miserable huts or tenements occupied by our agricultural labourers are owned, not by the landowner, but by itinerant individuals, who only look to their rent, and have neither the inducement nor the inclination to initiate an amended shelter. Health, physical and moral, are thus alike sacrificed at the shrine of a neglect which is the parent of large poor-rates and a demoralized and deteriorated population. If all the evils and sorrows arising from bad water, damp undrained houses, and indecent propinquity, could be accurately ascertained and valued, a frightful sum total would be placed to the debit and cost of landholder and tenant.

It is not in labourers' cottages alone that reform is required, for many of our ancient farmhouses are fatally unhealthy. Built upon the bare, wet, undrained clay, the water rises by capillary attraction up the walls (as it does in many of our churches); the result is a musty, clammy atmosphere in "the best room," and rheumatics or consumption among its inmates. I have seen the papering of the walls detached by the damp. Again, too often a moat of stagnant water surrounds the house, or it is shut in by dense foliage of trees, most injuriously to the occupants.

The interesting fact that I am now, for the first time in my life, speaking upon agriculture in a Farmers' Public Library, in a country town, naturally suggests to me the *question of* our general education. Can any one present *tell me how* many Farmers' Public Libraries there are in the *United Kingdom*? I fear they might be counted on one's

fingers; if so, honour and merit are due to the farmers of Faringdon for being foremost in the rank of intellectual progress. Here let me thank an intelligent Berkshire farmer, Mr. Spearing, for his able report on the "Farming of Berkshire," in the 21st volume of the Royal Agricultural Society's Journal.

Education for our labourers will dispel the clumsy and costly ignorance which too often obstructs agricultural progress, and the rising race of farmers will have educational opportunities which were denied to their forefathers. Thanks to my dear departed friend Richard Garrett, and many other good and wise men, the Suffolk Middle Class College will do wonders for the farmers of Suffolk; 300 boys, well fed, lodged, and educated for £25 per annum is indeed a boon, socially and nationally, for that example will soon be followed.

But education has no value if it is not used. I too often see youths return to their farm from a good school, and find at home nothing to read, except perhaps the local weekly paper. Their learning becomes rusty for want of use, for it is painfully true that an agricultural library is rarely to be found in the house of the British farmer. A £30 note invested in Morton, Stephens, Caird, Rham, Liebig, Johnston, or, by annual subscription, the journals of the English, Scotch, and Irish societies, the "Farmers' Magazine," and other publications, would pay a large though indirect profit. For my own part, I am always a learner. Ignorance is not bliss, even in agriculture; and I am pleased to see that the old cuckoo cry against "book" farming is gradually, though slowly, dying out. What can be more advantageous to agriculturists' progress than that they should meet "on paper," and there detail to each other the profitable or unprofitable results of their various experiments? The great secret of American progress is the general or rather universal use of education by the people. They have 120,000 public schools and colleges, where every person can be educated at free cost in a manner suited to his position. The Americans have always freely taxed themselves for these noble and useful institutions; and whenever a new district is populated, the first thing done is to provide ample lands and funds for the erection and endowment of the schools. Our good friend Mr. Howard told us on his return from America, that because the people are all educated they are all great readers. Long before ours, their cheap untaxed newspapers circulated to *such an extent* in proportion to the population, that although *comparisons* may be deemed odious, I am bound to say we

are, in comparison, a most unreading set, especially in agriculture; and yet, from the nature of the farmer's occupation, he must have much more time to read than the townsman, whose late hours at the desk or counter militate against his opportunities for study.

The mere reading of what is going on in other countries would enlighten our minds, stimulate our progress, and in some respects correct any over-estimate we may have formed of ourselves and of our doings. There is evidently great room for amendment in British agriculture if it be true (which I believe it is) that our gross produce per acre is only £3. 15*s.* and our capital only £4. My own capital is quite £15 per acre, and I must increase it with a view to enlarge my profits. Besides, a great deal of money is lost annually in farming. I will speak of amateur farmers by-and-by, but I now allude to what are called practical farmers. On poor stiff clays and inferior soils, badly farmed, I see their capital wasting away under the influence of non-drainage, deficiency of capital, and the shortcomings of both landlord and tenant; and still they come, one after another, to be, as it were, swallowed up in the insatiable vortex of non-improvement. All this is very painful, and it is owing to my seeing these disasters that I feel impelled to endeavour to stimulate to a better state of things.

As to amateur farmers (what a sentiment of glee I fancy must be felt at these words by some of my practical friends present!), I am constantly hearing of their going into farming with high spirits, and coming out with melancholy pockets; and I will tell you why it is so. They do not consider that farming is an art—a business, in fact, that demands great practical knowledge, some of which can only be got by long observation and experience. Their expectations are often too sanguine, and when I tell them that £1 to 30*s.* an acre, or 10 to 13 per cent. for their farming capital, is all they have a right to expect, even with good management, they seem surprised. They often begin by paying too high a rent, and are "let in" by an over-valuation; and unless they understand their business, or have an honest bailiff who does, they buy live stock and everything else probably 10 per cent. too dear, and sell their produce another 10 per cent. too cheap. In the order and management of labourers and other things there may again be a heavy per-centage of loss. All this soon brings amateur farming to a collapse.

It is all very well for gentlemen to buy "pedigree" stock at fancy prices, but they must also sell their progeny at fancy

prices too, or their "live-stock balance-sheet" will show an unpleasant result. They have to contend with men who have a rare eye for every point in an animal, and who will, by their superior judgment, almost create a pedigree stock. Instead of making 20*s.* an acre, they often lose 30*s.* or 40*s.* They should also learn most particularly to distinguish, in their investments, between permanent improvements and current farm expenditure. The former should be compensated by an increased charge for rental, the latter by annual profit. Nevertheless, I know many intelligent shrewd gentlemen who as amateur farmers have not only made it pay, but have by their good example raised the standard of farming of the district around them. In fact, we know that, in farming, as in other arts, many of the greatest improvements have been introduced by non-practical men. No greater difficulty attends the amateur farmer than that of getting an honest as well as able bailiff, one who can neither be corrupted by buyer nor seller, and who will devote himself entirely to his master's interest. Bad book-keeping, or too often no book-keeping at all, is, in agriculture, as in many other trades, a great failing.

FARM ACCOUNTS.

I annex, as it may be useful, a copy of my accounts for the last two years; 1865 being a good crop and low price, and 1866 a middling crop and a better price.

Although these years are by no means so good as many I have had previously, they will tend to dispel the too prevalent notion that Mr. Mechi's farming does not pay, and that it is the business in town that supports the farm. Without stock-taking, a knowledge of how much is owing to me, how much I owe, and how much cash is in hand at the end of every year, I should be "all at sea," and equally necessary is it that I should know how the live stock account stands, for that is the key of the position as regards the well-being and well-doing of the farm.

A reference to my accounts will show that my farm capital is about £15 per acre; that the rent I have to pay myself as landlord of my 128 acres before I can claim any farm profit, is 40*s.* per acre; and that while I pay 20*s.* per acre for 45 acres of land adjoining mine, which I have since improved. my own land has been assessed by three eminent valuers at *40s. per acre rental*, being 36*s.* for the land and buildings, *and 4s. for the use* of steam-engine and irrigating apparatus

My farm profit is therefore 10½ per cent., about £1. 11*s.* 6*d.* per acre, on my farm capital during these two years (they have been frequently much larger). A house, rent free, and some other conveniences, may be taken as another 2 per cent.

I was a good deal amused when reading a recent paper on book-keeping (Croydon Farmers' Club). A farmer said he had lost £250 last year. "How about the living?" asked another. His reply intimated that he lived out of the farm, but did not reckon that as profit. What would bankers, merchants, manufacturers, and traders say to this? They would not endorse that theory, for too many of them know that "a living" is all that they can get, and sometimes a very hard matter to do that. My farm accounts show the actual produce, and the money received for it. What I buy off the farm for my own use I pay for at the price it would bring in the ordinary market.

I would advise amateur farmers who have improved their land by drainage, &c., to have the improvements, when completed, valued, and the rent set upon the farm by competent valuers, just as if it was to pass into the hands of an ordinary tenant. This rent they would be bound to pay to themselves before they claimed any farm profit. This was my plan; indeed it was imperative, because I was so frequently told that my improvements were no improvements at all—a statement rebutted by the valuation. I should also recommend gentlemen farmers to have a proper valuation of stock, crop, implements, tillages, &c., made every year by a competent public valuer, and if they found the farm did not pay, such a person might be fairly asked to give a report upon the causes of such non-profit. The cost of all this would be trifling compared with its advantages. The live-stock account should always be kept separate, as in my case, for it is too often there that mischief arises.

I hope that my statement of accounts may prove useful. The question of capital in proportion to land is an important one. I have satisfied myself that less than £15 per acre would in my case be unsatisfactory. Imagine my having to farm three times the extent of my present holding with the same gross amount of capital, which would then be only £5 per acre,—where would be my live stock—the very soul of the farm?

As an average my live stock represents a capital of £6 per acre. I am afraid that the live-stock capital of the kingdom has only a value of £1. 10*s.* per acre, or equal to one sheep or lamb per acre on arable land. As an easy example o

accounts, every transaction for cash should be entered in the cash-book in detail, from which it would find its way to the ledger. I need hardly mention the necessity for a labour-book, field-book, and general journal of every-day transactions, not entered in the cash-book at the time.

Mr. Elliott, in his book, "Credit the Life of Commerce" (quoted by John Stuart Mill), says: "It is not too much to say that one-half of all the persons engaged in trade, even in London, never take stock at all; they go on year after year without knowing how their affairs stand, and at last, like the child at school, they find to their surprise but one half-penny left in their pocket. I will venture to say, that not one-fourth of all the persons in the provinces, either manufacturers, tradesmen, or farmers, ever take stock, nor in fact do one-half of them ever keep account-books deserving any other name than memorandum-books."

MEMORANDA.

I attribute the small amount of our national annual produce to a want of sufficient live stock, for if our recent statistics can be depended on, our cattle, sheep, and pigs (reduced to sheep), would only give one full-grown sheep to each arable acre. This is evidently very insufficient as a manurial agent, and not more than a third of the quantity on my own farm, although I have so little permanent pasture. I have therefore three times as much annual manure as the average of the country, and my corn crops are benefited accordingly.

In searching for agricultural knowledge I have been struck with the difficulty of obtaining satisfactory replies. For instance, if I ask "How many pounds weight of meat per acre do you produce over your whole farm, landlords' measure?" I can rarely obtain the information I desire.

Labourers' Wages.—I make a point of not paying more per piece or per day than my neighbours do; but I almost invariably employ my men piece-work. The consequence is advantageous to me—it economizes time, diminishes the number of men, increases their means, and thus improves their physical and moral condition. I think there must be some exaggeration in the statements about agricultural labour. I find that each of my men earns £35 per annum, independent of the earnings of their wives and children, harvest gleanings and beer. Farmers suffer materially by day-work, lose many

opportunities, and keep their men in a low physical condition. Manufacturers have no such weakness. My men have free access to small beer (1 bushel of malt to the hogshead), and an occasional pint of stronger. At harvest they have 6 pints of best beer (4 bushels to the hogshead). My farm beer costs about £20 annually, or 2*s*. 4*d*. per acre, or about 1*s*. per week for each labourer.

One of the most important causes of success in agriculture is to *adapt your crops and animals to the climate and soil.* An infringement of this natural law is sure to be attended with loss. I remember that a main part of the loss in my famous balance-sheet (1851) arose from having a large breadth of potatoes (27½ acres), tempted thereto by the success of a similar cropping on the Auchness farm. Potatoes love a humid climate and a friable and calcareous soil. In our stiff, cold, non-calcareous, ferruginous, collapsing clays we are safe with beans, mangels, cabbage, clover, wheat, and oats, but we must leave barley and turnips to lighter, warmer, and more calcareous soils, and permanent pasture to a more humid climate, or to the borders of streams.

The recent agricultural census is instructive in this respect. We there see that humid and mild Ireland has of her corn and root crops—

Per Cent.	Per Cent.
78·1 Oats.	70·9 Potatoes.
13·8 Wheat.	21·0 Turnips.
7·0 Barley.	91·9
98·9	

Scotland :—

Per Cent.	Per Cent.
73·5 Oats.	72·2 Turnips and Swedes.
15·6 Barley and Bere.	21·6 Potatoes.
8·1 Wheat.	93·8
97·7	

Wales :—

Per Cent.	Per Cent.
48·3 Oats.	44·8 Turnips and Swedes.
28·1 Barley.	31·8 Potatoes.
21·8 Wheat.	76·6
98·2	

England :—

Per Cent.		Per Cent.
42·7	Wheat.	58·2 Turnips and Swedes.
25·4	Barley.	11·3 Potatoes.
20·3	Oats.	9·2 Mangels.
6·7	Beans.	
4·2	Peas.	78·7
99·3		

Agricultural Statistics.—The difference between landlords' measure and the actual available space is so considerable, that I hope in future statistical returns we shall get a statement of the space occupied by fences, by homesteads, by roads and waste—all this is charged with rent, although no return is derived from most of it, I think it adds quite 10 per cent. to the rental. In my own case, after removing nearly all internal fences, the loss of space is quite 5 per cent. If the area of the United Kingdom is 77½ millions of acres, and the recent returns only account for 44 millions, can it be that nearly one-half our land is unavailable for production? Ought we not to know how these extra 33 millions of acres are appropriated?

It has been stated on good authority that one-half the land of England is owned by only about 150 individuals, while one-half Scotland belongs to only 12 owners. If these estates are all entailed, it must certainly somewhat restrict a great investment in improvements, although a recent Act of Parliament enables owners to charge their entailed property with a certain amount annually for improvements. Some great estates are very admirably farmed.

Long Fallow.—The recent agricultural statistics show that we have still in Great Britain (leaving out Ireland) 964,937 acres, or 1,200 square miles of land cultivated but not cropped. Is this necessary? I reply, certainly not, provided there is a sufficiency of live stock or manure. When I take two heavy wheat crops in succession, or wheat, beans, and wheat, I am asked, "Ah! but what do you do after that?" I reply, "Rest the land by taking 30 tons of mangel per acre." This is the fact, and it is simply a question of plenty of manure, deep cultivation, and ample horse-hoeing. I speak of my own poor heavy land. The land may be kept clean by proper cultivation without a long, unproductive, and costly fallow.

Chambers of Agriculture and a Minister of Agriculture are now strongly advocated. On the first there can scarcely be

a doubt as to its necessity and utility. The latter, I think, must be given up; for, if carried, we must also have a Minister for Commerce, another for Manufactures, Trade, Shipping, &c. A department of the Board of Trade and *Agriculture* would do all that is required.

Leases.—While many absurd restrictions in leases might be dispensed with, we rarely see one most important duty enforced; namely, that the mouths of the drains and ditches into which they discharge themselves should be kept constantly free and open. I have witnessed such culpable and suicidal neglect in this particular that I am induced to allude to it.

Whenever a spring drain gets choked by a water-plant or roots of a tree or shrub, it should at once be attended to, or an extensive area may be damaged, for water will head back in the land for miles by such a stoppage and neglect.

Arable or Grass Land?—This question, which is much discussed when wheat is cheap and meat dear, must be determined by soil and climate. On our stiff Essex clays, under a dry, hot, cereal climate, pasture should be the exception, arable the rule. Out of 170 acres that I farm, I have only 14 acres of permanent pasture as a run for my breeding stock. So much of our heavy tile earth contains iron and no lime, that the grasses produced on it have no fattening quality, while the quantity is small. This is what makes me somewhat doubtful about the Buscot pastures. Irrigation, natural or artificial, very much alters the case. It is better, therefore, on such soils to grow clovers, tares, mangel, and beans, the latter making excellent summer green food. On such soils I have this year realized £21 per acre in wheat and its straw, and £14 per acre in beans, and £12 in oats (besides the straw), where we should only have obtained £5 to £7 in grass or hay.

Ireland, with its mild and humid climate and limestone formation, is essentially a grass and potato country. Its cereals should be oats. Cornwall, Devonshire, Somersetshire, and all the western side of our island whose hills arrest and condense the warm Atlantic clouds, are much better adapted for grazing than our eastern coast. It could scarcely be believed in our eastern counties, where the rainfall is under 20 inches annually, or 2,000 tons per acre, that as much as 180 inches (18,000 tons per acre) have fallen in *one year at* Seathwaite in Cumberland, where the average is *127 inches.*

The general mismanagement of our grass lands is notorious; they are starved and robbed instead of being well manured, and in that state are best broken up for corn-growing. Grass land is easily improved by ample cake and corn feeding, artificial manures, and by hoeing and spudding out bad grasses and weeds, and sowing annually or occasionally good grass seeds and white clover. There is nothing, however, so remunerative or nutritious as Italian rye-grass, provided it is irrigated with sewage. After two years of such treatment the land is in first-rate order for pulse and then grain crops.

In the management of our farm we have often considered the question of laying down to grass, and have satisfied ourselves that our present mode of management is by far the most profitable. Plenty of well-fed stock, some purchased manure, and maximum crops of corn and straw, as well as of roots, pulse, clover, and tares, are best suited to our soil and climate.

Town Sewage.—Twenty-four years ago, when I first insisted on the propriety and profit of a national economy of our voidances, I almost despaired of its being carried out in my time; but great changes have come over the public mind, and false delicacy has succumbed to common sense—witness the Sewage Congress held lately at the fashionable town of Leamington.

The profit of such an economy is now no longer denied. Our towns and cities will require, and no doubt obtain, Parliamentary powers for the purchase of lands for the purpose of sewage irrigation, and then let them at improved rents. I hope that the great company forming to apply the sewage of the northern side of the metropolis to agricultural purposes may meet with success. Already they have made a beginning, on rather a large scale, so that the farmers through whose lands their great tunnel will pass (being practically convinced) may tap its contents and turn them to profitable account. Had they my practical experience of eighteen years in this matter, they would hasten eagerly to apply for such a boon. I am glad to know several large farmers who are looking forward to use it extensively. Our country ought to be constantly improving in fertility, for we not only consume all we grow, but also devour untold millions of foreign produce, solid and liquid—I believe to the worth of £70,000,000 annually. Surely the life-blood of the nation will no *longer* be permitted to rush in wasteful streams *through our sewers* to poison our rivers and ourselves.

Scotch Farming.—I was very much struck when in Scotland by the enterprise of Scotch farmers. It is no uncommon thing to see a tenant at the commencement of a lease of 19 years, investing some £10 to £15 per acre on drainage, liming, and other improvements. No doubt it is the lease that gives him and those who aid him with capital confidence of a profitable return; but beyond this, there is the intelligence resulting from a better education than is customary further south, and an appreciation and exercise of this education. This remark will also apply to the farm servants, labourers, and shepherds, who can all read and write. A southerner wonders how the Scotch can pay such high rents; but they waste no land in hedgerows and ditches, small fields and timber. Scotch farmers, used to a moister climate than ours, do not always succeed so well south and east. They complain, justly, of the want of intelligence in our labourers, and of insufficient house-room and accommodation for both man and beast. My Scotch friends are appreciating more and more oil-cakes as feeding substances, and no longer scold me for recommending plenty of cake-feeding as a sure means of growing plenty of corn.

Before I come to the conclusion of this long paper, let me entreat you to consider the unfortunate position of those unhappy farmers whose £3,000,000 worth of cattle have been swept away by dire disease. The Royal Agricultural Benevolent Institution presents a medium for some alleviation of the misery resulting from such a dreadful calamity.

The Results of Agricultural Improvement are cheering, individually and nationally. They increase the landlord's rent, the farmer's profit, and the food of the people. They elevate us in position and influence. The whole neighbourhood is benefited: machine and implement makers thrive, the shopkeepers and tradesmen find their receipts and profits enlarged; but, above all, there is a great increase in the employment of labour. Not only does this take place in the drainage, building, &c., but the permanent labour on my farm is doubled, although I use steam power and machinery. Other evidences of progression and improvement are exhibited in a new and newly-endowed church, a rectory, and school. A small dissenting chapel has been rebuilt on an enlarged scale, new cottages have been built, *and the physical*, moral, and religious condition of the popu*lation consider*ably improved.

I am now 65 years of age—my time is getting short. When it pleases God to call me, I shall, on my last pillow, be comforted with the conviction that my efforts to benefit my fellow-creatures, as well as myself, have not been entirely in vain.

TIPTREE ACCOUNTS.

JAN. 1.—Valuation :—	Paid. 1865.	Paid. 1866.
Live stock	£827 12 0	£1,144 10 0
231 fowls	20 0 0	20 0 0
7 horses, 1 donkey	124 0 0	154 0 0
Tillages, manure, &c	472 10 9	501 18 4
Hay, corn, &c. (unsold)	286 4 0	252 18 0
Implements	435 11 6	430 0 0
Fixed steam-engine and irrigation-pumps, &c., valued in estate		
Corn and hay for live stock, produce of farm, charged at market prices	301 2 0	188 14 0
Corn, cake, malt-combs, bran, &c., purchased for live stock	369 7 0	418 3 7
Grinding corn for live stock by our own engine at the usual prices charged to others	25 15 10	16 0 0
Sundries for live stock	7 19 0	4 4 0
Veterinary	1 12 6	
Medicals	2 16 0	1 15 0
Live stock purchased	281 0 0	185 15 11
Plough horse purchased	47 12 6	15 15 0
Horse food purchased from farm	114 0 0	105 16 0
Ditto purchased elsewhere	15 0 0	42 1 0
Farm labour, including engine-driver and working bailiff	386 16 11	353 12 5
Rent of chapel land, 45 acres	45 0 0	45 0 0
Tithes, taxes, poor, highway, church, and county rates	82 4 5	84 2 7
Allowed for wear and tear and depreciation of machinery and implements	25 0 0	25 0 0
Coals for steam-engine	51 10 0	31 7 11
Tradesmen's Bills :—Wheelwright, blacksmith, founder, harness-maker, bricklayer, carpenter, painter, basket-maker, cooper	57 8 0	41 8 11
Malt and hops for beer for labourers	22 0 0	21 9 6
Seeds and plants purchased	33 1 4	28 15 9
Do. of our own growth	29 7 0	42 19 0
Purchased manures	110 17 10	78 0 0
Do. straw	16 8 0	6 0 0
Miscellaneous Petty Expenses :—Mole and rat catching, mending sacks, postage stamps, stationery and farm account books, oil, candles, cart-grease, tallow, packing for engine..	8 1 10	5 10 0
Thatching	7 15 0	5 9 0
Thatching stuff	1 2 0	1 0 0
Corn-blowing machine	..	1 1 0
Sheep troughs	..	2 10 0
	£4,208 15 5	£4,255 16 11

Dec. 31.—Valuation :—	Received. 1865.	Received. 1866.
Live stock	£1,144 10 0	854 6 0
Poultry	20 0 0	30 0 0
Horses and donkey	154 0 0	130 0 0
Tillages, manure, &c.	501 18 4	489 7 8
Corn and hay, &c., unsold	252 18 0	636 12 6
Implements	430 0 0	425 11 6
Corn sold for money	601 5 10	478 19 9
Corn and hay sold to live stock as per contra	301 0 0	188 16 0
Peas (for picking) sold	44 0 0	2 0 0
Home-grown corn used as seed and charged per contra	27 2 0	42 19 0
Oats, beans, and hay, home-grown, sold to our horses, and charged per contra	114 0 0	105 16 0
Hay sold	72 17 0	10 2 6
Mangel roots and seeds sold	39 17 6	91 10 3
Meat sold	813 1 0	1,123 7 11
Wool sold	19 10 0	54 1 1
Poultry and eggs sold	44 10 9	43 15 0
Grinding for hire	73 15 4	32 5 3
Grinding for our own stock	25 15 0	16 4 6
Milk and butter	11 5 0	12 0 0
Rent of cottages	15 17 0	15 17 0
Dead horse	..	0 15 0
	4,707 2 9	4,784 8 5
Paid	4,208 15 5	4,255 16 11
Balance for rent of 128 acres and profit on £2,500 farm capital	£498 7 4	£528 11 6

LIVE STOCK.

Jan. 1.—To valuation of bullocks, sheep, pigs, and poultry now in hand	Paid. 1865. £847 12 0	Paid. 1866. £1,164 10 0
Hay and corn purchased from our own farm at market prices	301 2 0	188 14 0
Corn, cake, malt-combs, bran, &c., purchased elsewhere	369 7 0	418 3 7
Grinding corn by our own engine	25 15 0	15 0 0
Veterinary medicine and sundries	12 7 6	
Live stock purchased	281 0 0	185 15 11
	£1,837 3 6	£1,972 3 6

LIVE STOCK.

Dec. 31.—	Received. 1865.	Received. 1866.
Meat sold	£813 1 0	£1,092 9 11
Wool sold	19 10 0	54 1 1
Poultry, eggs, &c., sold	44 10 9	55 15 (
Valuation of bullocks :—		
Sheep, pigs, and poultry in hand	1,164 10 0	884 6 (
	£2,041 11 9	£2,086 12 (

CAPITAL ACCOUNT.

	Dr.		
Dec. 31.—Sundry unpaid accounts owing by the farm			
Farm Capital:—	Cr.		
Valuation on the 31st December	2,561	17	6
Cash in hand or at banker's			
Outstanding unpaid accounts owing to the farm			

APPORTIONMENT OF FARM CAPITAL.

Live stock	£6	0	0
Horses	1	0	0
Tillages	2	10	0
Implements and machinery	2	10	0
Hay, corn, &c., unsold	3	0	0
Per acre	£15	0	0

MY ANNUAL COURSE OF CROPPING.

	1865.	1866.	1867.
	Acres.	Acres.	Acres.
Wheat	42	55½	56½
Barley	12	12½	11
Oats	14½	12	7½
Beans	17½	6½	13½
Peas	8	8½	17
Clover	13½	20½	12½
Permanent pasture	14½	14½	14½
Sewaged Italian rye-grass	12½	12	12
Mangel-wurzel	16½	10½	9
Cabbage	3	1	1
Winter tares for feed	6	6	4
Carrots	—	1	½
Swedes	—	—	1
Available acres	160	160	160
Cabbage after tares, second crop, same year	6	3	5
White turnips and rape after peas, second crop	8	8	6
Swedes after tares, second crop ..	—	3	—

Available acres	160
Fences, ditches, and road	5
Ditto on my own farm	7
Buildings, stackyard, &c.	2
Private house, garden, and shrubberies	3
Total (landlords' measure)	177

Where white turnips are taken after, the peas are removed directly they are *cut, and made on* another field. This gives more time for turnips.

In 1865 the live stock left about £6. 10*s.* per acre for the root and green crops consumed, after paying for all purchased food. In 1866 they only paid £5 per acre, because corn, cake, &c., were all dearer than in 1865, although meat was, if anything, rather cheaper. The labour attendant on stock is charged in the general labour account. If it and the engine coals, &c., were charged to the live-stock account, very little would be left for the green and root crops; and yet I consider it is this great consumption of purchased food and consequent manure that makes the farm pay: without it, it would not pay.

The tillages comprise the cultivation, seeding, and manuring. Our preparation for the mangel crop, including rent, &c., costs about £12 per acre. Beans are also well manured; so are cabbages. The land for mangel and cabbage is always deeply trench-ploughed after being manured. The preparation for mangel is always before Christmas. Wheat is manured for with 2 cwt. of guano, and some salt when taken after beans, roots drawn off, or wheat. Peas are taken after two years Italian rye-grass. White turnips on the light land are fed off early, and followed by either wheat or barley. 1,400 loads of good rich manure were produced on the farm last year and applied to the soil. At present, we see no mode of farming this land likely to be more remunerative than our present system. Much straw is used as food cut into fine chaff and mixed with pulped roots, ground corn, rape, linseed or cotton-cake, malt-combs, and bran. Our farm horses have all their food prepared and comminuted. They are rarely turned out, except sometimes at night during harvest.

The practice on my farm is based upon the theory that the growth of corn and other agricultural products is made to depend upon the making of meat. There is a great advantage in this system, for when corn is at a low average price I sell it to my live stock, and thus increase my store of manure, and, *pro tanto*, prevent overstocking the corn market. Last year, when revett wheat was only 36*s.* per qr., or 1*s.* per stone of 14 lb., I ground it up for my bullocks, mixed with other substances. This year, with the same wheat selling at 55*s.* per qr., I sell it to the miller or factor, because, meat being rather cheaper than last year, it would not answer at such an improved price to consume it. The same remark holds good for barley. We invariably *consume all our* beans and oats—sell them, in fact, to our *stock. This high* system of farming keeps the land always

ready for a good breadth of wheat when it is dear, and forces maximum crops at all times. I entirely dissent from the modern theory that we must make meat only, and depend on foreigners for our wheat. On the contrary, I grow more wheat and make more meat concurrently. This I have proved to be a sound and profitable practice.

The foregoing live-stock balance-sheets confirm in a remarkable degree my celebrated live-stock balance-sheet that created such a furor in 1851 (see p. 188 of my book); they prove that if you charge the live-stock account with the cost of green and root crops, attendance, labour, interest of capital, rent for shelter, in addition to the purchased food (as was all done in the 1851 balance-sheet), the live-stock accounts will show a considerable loss. In the present balance-sheet these expenses are charged in the general farm account. That live-stock account was almost as favourable as my recent ones, taking into account the enormous quantity of purchased food. The wisdom of those large investments in purchased food is confirmed by the very much greater consequent yield of every crop.

AH! MR. MECHI, BUT DO POULTRY PAY?

THAT is a very proper question to ask, for I hold as a principle that everything that does not pay, directly or indirectly, should be abandoned as commercially and agriculturally wrong.

I test this by the following propositions and comparisons. It pays indirectly to produce cattle, sheep, and pigs—if so, why not poultry? It does not cost more to produce a pound of poultry, live weight, than a pound of meat live weight. Well, then, do poultry sell at more or less per pound live weight than meat? The answer to this is, "A pound of poultry live weight always sells for much more than a pound of meat live weight," and so the question is settled in favour of poultry.

The average price of first quality beef is 5*s.* per stone, or 7½*d.* per lb. for the whole carcase net dead weight. The live weight price would therefore be 4½*d.* per lb., because, according to the best authorities, fat beasts lose 40 per cent. of their live weight in offal. The average live weight price of the best poultry is quite 9*d.* per lb., or double the price of beef, and not quite double the price of mutton. At this *time of year,* poultry sell wholesale for much more than

double the price of meat. Those I have sent to market recently have sold for 11½*d.* to 1*s.* per lb. live weight—against 4½*d.* per lb. live weight for beef, which is its present price. That settles the question so far, and the verdict is strongly in favour of poultry. Poultry are evidently dear food to the consumer; but does it cost more food to produce a pound of poultry than a pound of meat live weight? I answer, Decidedly not, but the reverse; for my cattle and sheep don't eat worms and insects, whereas fowls consume them abundantly, and economize and apply every scattered seed or kernel that would otherwise be wasted.

In another point of view—is the cost of attendance and shelter greater with poultry than with cattle? I reply, "No." As to the production of eggs, that depends upon the quality and quantity of food administered, and the accompaniments of proper warmth and shelter. There is no fear of overstocking the market with either eggs or poultry. We consume daily one million of foreign eggs!

I generally keep from 300 to 400 fowls. They have free access to every field during the whole year; and although they help themselves at harvest time when the corn is in sheaf, I always get my best crops of corn on fields adjoining the hen-house.

I have this year two fields of wheat drilled, and only one bushel of seed per acre. They come within ten to twenty yards of the fowl-house, and are a perfect plant, although the poultry have been scratching and cultivating the fields ever since they were drilled.

We are apt to forget that fowls, like sheep, manure where they go. I must say I used at one time to feel nervous and angry when I saw them hard at work on the newly-sown corn; but I soon learned to feel confident that insects were their principal gain, and that my well and deeply deposited corn escaped.

I might well feel sensitive when I knew that many unrelenting and not too favourable critics would inspect those crops before harvest, and that "thin sowing" would get the discredit of any shortcoming in the plants. Under the old broadcast system and consequent imperfect burying of the seed, fowls would have been mischievous. I look upon them now as the farmer's best friends.

It is essential to the well-doing of poultry that they *should have free* access to grass, clover, and green food. *They are very fond* of mangel and swedes, but I never found *that they injured* them while growing.

"But they ate off my mangel plants," said a friend of mine. I replied, "I am sure you had no pasture." He acknowledged that he had not, and so the matter was at once accounted for. There is no fear of slugs where there are plenty of ducks. The quality of food has much to do with egg-laying. The high price of barley and wheat induced us to sell what would ordinarily be called "tail-corn," so that the poor fowls came off badly with the mere refuse. The consequence was a diminished supply of eggs; so soon as we returned to the best barley, the concurrent supply of eggs also made its appearance. I find that with Bramah Pootras, Cochin China, and Game (crossed) we get size and quality; we do not separate the breeds, but take care to breed from pure stock on each side, changing the male birds every second year. We are fond of Dorkings, but our soil and climate seem too harsh for them. Not a scrap of bread or any other consumable substance is wasted where they are. Boiled potatoes or their parings, and every waste from the kitchen, is at once appropriated. A dead lamb or sheep soon becomes skeletonized by them. Flies have no chance with them, if they settle within reach. The more we remove trees, fences, and shelter for wild birds, the more necessary, and in fact imperative, it will become to greatly increase our store of poultry, that they may scatter over the land and appropriate the farmer's numerous insect enemies. In this respect I may at all events call myself a practical man, for I rejoice when I see my fields well dotted with poultry.

If farmers had a good share of winged game when killed, they too should rejoice in its abundance. It is, in my opinion, a sad mistake to send battue game to the poulterer rather than to the tenantry. The money amount is trivial when compared with the discontent that would be thus mitigated or entirely allayed. I repeat here what I said at p. 572 of my book in July, 1864:—

"Nothing pays better on a farm than a good stock of poultry properly managed. With them everything is turned to account; not a kernel, wild seed, or insect escapes their scrutinizing eyes. Their industrious claws are ever at work uncovering, ready for appropriation, every hidden but consumable substance. Fowls must have free access to chalk or lime to form the shells of their eggs, and grit or gravel to grind the food in their gizzards. They luxuriate on grass or clover, which are a necessity for them; in winter they like *mangel or swedes*. They must have access to plenty of pure

water. The quality of the eggs depends upon the quality of the food. They, like ourselves, like shade in summer, and warm sheltered corners in winter. They must have access to shelter in wet weather. Fowls will not be long healthy on the same ground or yards; the earth gets tainted. Therefore, to prevent disease, lime and salt your yards, and their usual pasture once a year—say, in autumn, when the rains will wash it well in and sweeten the surface.

"Broods of chickens never do better with us than on the grassy brows or patches abutting upon the growing crops, either of corn or pulse, into which they run for either insects or for shelter. The roofs of the coops should be water-tight, and the coops should often be removed, having only the natural ground for the floor. That natural ground soon gets tainted unless you remove the coop.

"You can hardly make some people good managers of poultry if they lack observation and judgment. These are especially necessary in the breeding of poultry. Your male birds should be often changed—say, at least once in two years—and they should be young and vigorous. Breeding in and in will not do, any more than it will with animals. Those who wish to understand the proper management of poultry and winged game should read the admirable little pamphlets of Mr. Baily, Mount Street, London. Very few people know so much of this matter as he does. From him I obtain pure blood occasionally at a moderate price.

"I consider winged game, poultry, and birds the farmer's friends. My poultry have access at all times to my fields. Fowls are very useful in clearing off flies. I have often been amused at seeing the neat and quick manner of their taking flies from reposing bullocks and sheep, much to their comfort."—*March* 29, 1867.

POULTRY.

It is during winter, and especially in snowy weather, that poultry are more costly to feed; and it is at that time particularly that we should have regard to their comfort by shelter and warmth. See what takes place now (April 5). As soon as the ducks are let out, they disdain to pick up the barley, but toddle away to the clover-field and search it from top to *bottom, then betake* themselves to the ditches or brooks. *Nothing living escapes* their quick eyes. After the horse-hoe

the fowls are spread over the fields, scratching into particles every patch of earth between the rows of wheat plants; and from the frequent applications of their "peck," we can form an idea of how many insects or plant enemies were there ready to do mischief, and how effectually the crops are thus secured from damage. No wonder that my corn and other crops near the poultry-house are always satisfactory. It would have paid many heavy-land farmers this year to have bought ducks, and so saved their crops from destruction by slug. An old shoemaker in this neighbourhood, too blind to work at his trade, has devoted his workshop to chicken-rearing, keeping a fire in his grate all winter. The consequence was an abundant supply of eggs at 1½*d.* each wholesale, and young chickens that in a month's time will bring 7*s.* per pair wholesale. He has thus realized exceptional and profitable results, and escaped that competition of cheapness and abundance which is produced by mild or summer weather. —*April* 6.

APRIL WORK.

Spudding out docks before horse-hoeing; 38 acres wheat clean horse-hoed in two days with Garrett's horse-hoe by one man and two pair of horses. Couch-grass forked out of ploughed land before scarifying, harrowing, and drilling. Wheat harrowed crossways after the horse-hoe. Women pulling groundsel out of clover before it flowers: nothing pays better than labour employed in the removal of weeds. Rows of wheat hand-hoed where required. We shall soon sow artificial manures on the deeply winter-cultivated land for mangel scarifying, and harrowing it well; but before all this is attempted, all couch-grass will be forked out and carried off the land. The severe March weather stunted the grass, and made feed scarce; roots, too, are nearly finished, and very scarce. Luckily, we disposed of nearly all our fat stock in good time and at good prices—say 63*s.* for our hoggets barely one year old, and £23 for bullocks barely two years. Fat stock is getting cheaper now. A great change and improvement has taken place the last few days in the appearance of the crops. Drains have ceased running, and the land has dried considerably.—*April* 10, 1867.

LIME AS A CURE FOR SLUGS.

At midnight we sowed lime at the rate of 4 bushels per acre on the 1½ acre of wheat which they had attacked. The lime was sown against the wind, and the lantern showed that they were out feeding, and had been destroyed by the lime. Not a blade has disappeared since. It is clear to me that we had been neglectful in not applying it earlier. As soon as a few plants were missed, the lime should have been sown. We had, however, attributed the loss of plant to the wet weather. Our attack from wireworm on the light land was at once arrested by the salt dressing, which I have always found a certain cure if taken in time. The damage done by slug this season has been very considerable, and wireworm, on the light lands, has done much mischief. As it is, half my peck of wheat per acre is uneaten by slug, and the adjoining 3 pecks per acre will probably be all the better for having been partially destroyed. I have 50 acres of wheat a full plant from 1 bushel per acre—in fact, some of it would be, in my opinion, better if not sown so thick. It is clear to me that lime should be sown late on a mild night, and against the wind, in order effectually to destroy the slug.—*April* 11, 1867.

A WALK OVER MY FARM,

On the 23rd of April, 1867, suggests to me many reflections. First, that this is, as compared with last year, a more natural season, with winter at the right time, and now genial spring; consequently we have the promise of a much more abundant crop than in 1866, when the forced growth produced by an unusually mild winter was crippled and almost destroyed by severe frosts in April and May. This remark applies equally to our fruit-trees.

There has been, however, one drawback as regards lands undrained, naturally or artificially—I mean the large amount of snow and rain in March and April. When I ask myself how it is that the crops on my own poor heavy land are so intensely green, and promise so abundantly, while on similar soils elsewhere they look pale, thin, and faint, the answer is *painfully obvious*. Into these undrained subsoils, now filled *with stagnant* water, the nascent spring roots refuse to enter,

so the plant gives bilious evidence of its unfavourable condition. One may safely predict that, in such cases, the difference or deficiency of the wheat crop, as compared with the drained land, cannot be less than 1 to 2 quarters per acre, or in money value at present prices from £3. 10*s.* to £7 per acre. The same remark applies in degree to other kinds of crops; and yet the interest or annual charge for perfect drainage would be less than 10*s.* per acre.

Without any desire to boast of my own crops, but with a sincere and earnest intent to stimulate and encourage agricultural improvement, I state that my crops promise to compete with those of the richest lands in the kingdom; and I trust that, ere harvest arrives, those who desire to satisfy their minds on this point will come and judge of the crops for themselves.

Here are 50 acres of wheat, drilled with only 1 bushel per acre, in luxuriant bunches really too thick; oats drilled with 2 bushels per acre, and barley 6 pecks per acre—all a full plant. Beans, peas, tares, clover, and Italian rye-grass—all in full vigour. Young lambs, plump, straight in the back, and vivacious; and this on land not naturally better than Woking Common or many of our wastes.

The truth must be spoken. If those wastes were well drained, deeply and cleanly cultivated with perfect implements, and then well manured with the unwashed voidances of well-fed animals, they too might produce food results beneficial to the country, and profitable to capitalists.

Said one of my men to me to-day,—"Master, I think you will be able to thrash 100 quarters of wheat at harvest time, and then have all your stack-frames full." And I quite believe we shall. Now, when it is considered that I have 12 stack-frames, besides a very large barn; and when it is remembered that when I first bought the farm I was told by many practical men that I should never grow enough to fill my great barn, it is not to be wondered at that I am very full of comfortable and consoling reflections, and that I am more and more convinced how much this otherwise great country suffers from an insufficient investment of intelligence and capital in the production of its daily food.

My thick-sowing friends will be astonished to see my crops. It will do them good to come just before harvest. The 3 pecks per acre will be ample, although well eaten by slug; and even the poor peck an acre, which was almost destroyed by slug, promises to surprise us, although I think it *can hardly be* a full crop.

While passing last week from Salisbury towards Axminster, I saw for five miles on each side of the road that which gratified me exceedingly,—I mean unmistakable evidences of an intelligent and patriotic appreciation and realization of our national agricultural requirements. The whole property belonged to the late much-lamented Lord Sidney Herbert, and is now in the possession of his son, the Earl of Pembroke. For the whole distance were noble premises of an architectural character suitable for farmers of intelligence and capital. Good residences, substantial farmeries, and above and beyond all, no end of well-placed labourers' cottages, which gladdened the eye but sorrowed the heart, when I contrasted them with the wretched and demoralizing hovels of our general agriculture. Many of those cottages and farmeries have been erected since the death of the late lord, but the plans and arrangements were all completed before his death. Here are fine farms of from 600 to 1,000 acres. No miserable 3- or 4-acre fields, shut in by great hedge-rows and large timber trees. How can farmers so placed compete successfully with such as I have here described?

Where there is sufficient capital, who can doubt for a moment the pecuniary advantage of such a state of things as regards the landlord, tenant, and country at large? I am pleased to find that these excellent cottages were let to the labourers at one shilling per week, and that attached to each was an ample vegetable ground or garden.

So far as I saw, the labourers and shepherds compared favourably with those ragged specimens I have too frequently met in certain ill-paid and ill-housed districts which shall be nameless.

The fine flocks of well-bred Down sheep were to me a gratifying sight. I should, however, have been better pleased had they been supplemented by cattle in the yards eating straw and cake, and thus producing manure to force maximum wheat and other crops.

Before I conclude this paper, I would advert to a too common but very painful result arising from a misconception or under-estimate of the cost of carrying out agricultural improvements both on the part of landlord and tenant.

A purchaser of unimproved land should reckon that to put an unimproved farm into a suitable condition for a tenant of capital and intelligence, the outlay should probably be—

A new residence	£2 to 3 per acre.
Farm buildings	6 to 7 „
Proper roads, squaring of fields, and removing fences, &c.	1 to 2 „
Drainage	6 „

So here is a total of some £15 to £18 per acre as landlord's outlay.

The tenant would require on a heavy-land farm, mostly arable, about £15 per acre, independently of any extra investment for chalk or lime,—

Steam-engine, thrashing-machine, millstones, pulpers, chaff-cutters, drills, and the usual farm implements .	£2	5	0
Tillages	2	10	0
Horses	1	0	0
Live stock (as in my case)	6	0	0
Unsold produce	3	0	0
	£14	15	0

A complete set of Fowler's steam ploughing and cultivating apparatus would cost near £1,000.

For want of sound calculation in these matters, landlords (and tenants too) often break down or get involved, as I have painfully witnessed, and are thus deprived of the fruits of their investments.

We hear complaints of the want of good tenants, but there is no lack of applications for farms by substantial men, where, as I know in many cases, proper accommodation is provided by the landlord for farmer, labourers, and animals.

It is idle to expect to produce food for the people, and profit for the farmer, without larger investments of capital and intelligence.

BARON LIEBIG.

LET me advise my young practical friends to have in their agricultural library the Baron's works on Agriculture ; viz., "Chemistry in its Relation to Agriculture," "Principles of Agriculture," and, above all, "Letters on Modern Agriculture," and "The Natural Laws of Agriculture."

It is only by the perusal and the frequent re-perusal of these original and profound works that we can form a true estimate of our agricultural ignorance, and the mere empiricism of ordinary agriculture. It is here that we learn the *why and wherefore* of our agricultural puzzles—why, in one

case, nitrate of soda, salt, or bones are a great success, in others a perfect failure—why certain plants succeed on one soil, and fail in another—why a rotation of crops is necessary.

These works teach us, for the first time, that each plant is variously composed, and that the want or absence of any one of its component parts will render unavailable all the others, much as in building a house we may have lime, bricks, slates, sand, boards, nails, and labour, and yet they will all be useless for the want of one element—water, or any one of the other materials. From him we learn how unprofitable it is to leave the soil below the ploughed land undrained, uncultivated, and unmanured, for he proves to us that we cannot manure the heavy subsoils through the top or ploughed soil, and hence all deep-rooted plants fail to come to their fullest development. Altogether we owe to that great philosopher an imeasurable debt of agricultural gratitude.—*April*, 1867.

AGRICULTURE A NATURALLY SLOW BUSINESS.

ARDENT, ambitious, and impatient minds, anxious for speedy accumulations of wealth, must not look to agriculture for a realization of their desires. Nature will have its course. A wheat crop is a nine months child, and another nine months is taken in its realization. One year for sheep and two years for bullocks are the very earliest returns that can be expected, and then we have adverse seasons to contend with. Besides, there is not the opportunity for credit, as in trade; where an honest, industrious, and prudent young man may be trusted and encouraged by manufacturers; fortunately this is so, or else who would submit to the murky confinement of a town life? Agriculture ought to be very intellectual, for there is plenty of time for study and reflection while the crops are growing.

No doubt pure country air is a more sleepy atmosphere than that of a town—at least my town friends say so; but in my opinion much of this effect is due to the tranquillity of Nature as compared with the noisy traffic, bustle, and flaring *gaslights of* a crowded city; so we countrymen must be *excused for being* somewhat dull and stolid.

I have remarked frequently how ready my town friends are for an early bed when in the country, and how soundly they repose.—30*th April*, 1867.

THE FATTENING OF YOUNG GROWING ANIMALS.

THE days of four and five-year-old beef and mutton are passing away under the influence of modern agriculture, which requires a more speedy realization; one-year-old mutton and two-year-old beef are becoming the order of the day. To arrive at a satisfactory conclusion in this matter it is necessary to take a review of the conditions required. Young growing animals are like young growing schoolboys —who, always in motion, rarely get fat;—so it is with young growing animals; allow them to roam at large, and vain will be your efforts to produce obesity. At one year old my sheep are extremely fat, and at two years old my bullocks are full of fat, the lean being everywhere well mottled with intervening fat. The result is a rich mellow meat, satisfactory to the butcher, because pleasing to his customers.

The flavour may be somewhat higher in old meat, but the fibre is hard, and not easy of digestion, unless well hung in cool weather. Large joints, too, are unsuited to small families. Good rich food from their birth, and a limited area for exercise, are essentials for early fattening. In addition to cake, corn, malt combs, and bran, a small quantity of crushed linseed and a little condimental food are essential to early ripeness. I could never satisfy myself or my butchers until I gave my young bullock 1 lb. daily of crushed linseed, and about 1 lb. of condimental food. I have this year sold my bullocks (exactly two years old) at £23 each, and my sheep (one year old) at £3. 3*s*. (half-bred Down and Lincoln). Linseed contains 25 per cent. of oil, and in that form it appears to answer admirably as a fattening ingredient. The stimulants in the condimental food, such as fenugreek, ginger, and caraway, prevent flatulence, and facilitate digestion.

My bullocks rarely get more than one bushel of pulped or cut roots daily. Although I have not used it myself, I know of cases where linseed oil, mixed with bean meal, has been most effective in putting on fat. I again commend a study of the late Mr. Horsfall's most valuable papers on "Fattening

and Dairy Management," in the 17th and 18th vols. of the Royal Agricultural Society's Journal. Our lambs, after leaving the ewes, are generally folded; our bullocks kept in sheds.

Locusts, molasses, and sugar, being all soluble saccharine substances, promote early fattening.—*30th April*, 1867.

THE LABOURER'S FOOD.

It is instructive to see how a natural instinct has caused the labourer in South Britain to select the most economical as well as the most nutritious food, well adapted to climatic requirements,—viz., bread and cheese—much of the former, little of the latter;—at night for supper some hot potatoes and a tiny slice of fried fat pork, also some very small beer provided by the farmer (one bushel of malt to the hogshead). Said one of my labourers to me to-day, "There are eleven of us (baby included), and we consume in bread and puddings five pecks of flour weekly, equal to twenty 4 lb. loaves, and we could eat more." As the price of flour is 2*s*. per peck, this makes a large claim upon the man's *average* weekly wages of 14*s*. 6*d*. per week, and leaves little for rent, clothing, firing, cheese, butter, milk, and grocery. It is true his three eldest children earn a trifle, for without this he could not go on. How unfavourably a deficient harvest like the last tells upon the agricultural labourer! There is less corn to harvest, thrash, dress, carry out; less straw to cut up, and less manure to cart; in fact, with considerably dearer food, the demand for his labour is diminished, and the farmer is no better off than with an abundant harvest and a low price.

But to return to the food. We all agree that milk contains all the elements necessary for the formation and support of the human frame, and that before dentition it is the most suitable form of nourishment. In the cheese we have all, or nearly all, the elements of milk; and so we have in bread, though in a less condensed form; so that we may safely rely upon bread and cheese as strength-supporting food. As to economy, we must also give for it a most favourable verdict. The price per lb. of meat and cheese are about equal; not so their nutritive *properties. 1* lb. of cheese contains only 6 oz. of water; 1 lb. *of meat about* 12 oz. of water. In Mr. Morton's admirable

"Cyclopædia of Agriculture," vol. i. part 1, p. 440, under the head "Cheese":—

"It will be seen from the foregoing analysis that cheese is an exceedingly nutritious substance, standing considerably higher in this respect than butcher's meat.

"Dividing the constituents into the principal nutritive groups, cheese is composed as follows:—

Flesh-forming substances	31·02
Heat-giving substances	25·30
Mineral matter	4·90
Water	38·78
	100·00 "

The instinct of growing children attracts them to cheese, and it is a great mistake not to allow them to indulge that instinct. My children have always had free access to bread and cheese, and the result has been a most ample and vigorous development and unobstructed health. We may leave out of the question "curry powder," and the labourer will find a sufficient stimulant in a strong raw onion: the needful salt he gets in his cheese. Unfortunately, I fear that too many labourers' children get a very short supply of cheese. Seeing that cheese is so nutritious, we may reasonably expect that its exportation from the soil is a heavy tax on its fertility. Our farming requires good natural soil, or very high farming, or we shall grow little corn where cows are kept for cheese or milk.—*May*, 1867.

MAY 2, 1866, AND MAY 2, 1867.

WHAT a contrast. This day last year, a heavy thunder and hail storm, the ground afterwards covered with snow. To-day, a genial temperature, a lovely sunshine, the surface-soil dry and crisp and warm; smoke ascending vertically, light airs fluctuating from all points of the compass. All this gives us hope of a better harvest than last year, when we had severe frosts up to the end of May. Spring crops plant admirably. Now is the time to judge whether the wheat crops are "going to Halstead Fair," which is on the 6th of May. It is a saying in Essex, when the wheats look pale and bilious early in May, that they are going to Halstead *Fair, and will never return.* How truly plants testify by

their appearance to the condition of the subsoil in which their roots ramify!

On deeply and clean-cultivated, drained, and well-manured land they have the colour and bloom of the cucumber. On the contrary, without drainage, with foul and shallow cultivation and insufficient manure, the thin, narrow, pale, vertical leaf, with its yellow tinge and slow growth, almost reproaches man for his suicidal neglect. A paltry saving of a few shillings per acre, in not eradicating the weeds at the right time, permits them not only to starve the wheat plant, and thus greatly diminish the crop, but also stocks the soil with innumerable seeds of weeds for future and still more injurious competition. When 2*s.* worth of labour will spud out several hundred docks in a day, who would not readily pay it? After all, it is in the subsoil, below the ploughed land, where most of the mischief takes place, for that subsoil is raw, unaërated, and unmanured.

The roots of our wheat crops have already passed through the ploughed land, and as they descend into the subsoil its unhealthy condition affects their appearance and growth. A rank old dock or thistle will plunge its roots deep into this subsoil without suffering; not so the corn plants. Beans are the most hardy in this respect.

Passing at railway speed, we can detect readily those fields of corn that are suffering from the causes I have named. Experience has taught me that the removal of these causes is a profitable operation, and that neglect or want of means for such a purpose results in heavy pecuniary loss.

A high temperature of the soil promotes the growth of plants. Drainage, deep and clean cultivation, raise the temperature of the soil. I have in my conservatory a striking instance of the advantage of warmth to the roots of plants, and consequently to their general development. An ordinary bricked flue passes (below the surface) near the roots of some camellia and other trees, and raises the temperature of the soil; the result is a most vigorous development, and very numerous and large flowers at least two months before any are produced by those on the other side of the conservatory. The temperature of the atmosphere is alike for each; but the temperature of the soil being higher in one case than in the other causes the difference. It teaches us that we should by every means in our power endeavour to increase the *temperature* of the soil.

Spring sour crops look remarkably well, and so do clovers —*on well-managed* farms.

Many heavy land fields of wheat have been destroyed by slug, and are re-sown with oats or barley. I have only lost about one acre in this way, including a part of my peck an acre.—*May* 3, 1867.

RATS.

Has any one ever estimated the number of rats that prey upon the farmer's property? Allowing one to each acre, we should then have about sixty millions in the United Kingdom. As animals consume according to their weight, a full-grown rat would consume much grain in a year. But, unfortunately, it is not only what they consume, but what they destroy that concerns us. Said an old labourer's wife to me, "A rat has taken away in one night eight of my brood of young ducks, worth 8*d.* apiece. My neighbour, Mrs. B——, a small farmer's widow, cannot raise any poultry, for under her house is a honeycomb of rats' runs. She took them in a hamper into her sleeping-room last night, and even there they tried to get them out."

I can testify to their destructive powers from experience. When they have young, they will carry away and store up scores of young chickens, ducks, or turkeys in a single night, much the same as a cat having kittens. A friend of mine who had a little rabbit warren opposite his windows, saw his cat catch a young rabbit. He followed her, and found that she already had laid up thirty-six that morning near her kittens. I have known of a brace of foxes taking thirty-seven turkeys in a single night, and burying many of them up in some dung-heaps which were upon an adjoining field ready for spreading.

When hard pressed for food for themselves or their young, rats are very daring, and will attack large chickens and good-sized rabbits. I know a case where a youth was awoke in the night by a rat beginning upon his ear. Wherever stock are fed with meal or grain, there the rats will surely come, to share, with the pigs especially, their barley-meal and pollard.

When dining at Vintners' Hall with the late excellent Mr. Green, the great shipowner, he said to me:—"Mr. Mechi, I can beat you in pigs: I make a thousand a year *by my pigs.*" I expressed my surprise, and said if I

got their manure free of cost I thought myself a lucky fellow. "Well," said he, "I have only sixty pigs; before I kept these pigs the rats used to damage the sails of my ships to the extent of a thousand a year, eating every greasy portion. They now dine with or after the pigs, and never touch the sails." This hint may be useful to shipowners as well as to housekeepers, who find that the mice destroy the greased or stained portions of table-cloths.

Rats migrate, and travel a long way in a night in search of food. A neighbour of mine told me that he one night met a small army of them, some hundreds together. The carelessness of some farmers, or their false economy, causes serious loss to their neighbours. They may be called rat-preservers or rat-breeders. I used to pass frequently by two wheat stacks which were completely honey-combed by the rats, whose paths into and up the stacks were visible from the road. Having consumed nearly all the grain, they left the stacks for better quarters. When threshed there was plenty of straw, but the corn was nearly "nil." Those who keep their corn in stacks for seven years (and I know of some who do so) had need have an eye to the rats. I have used a dozen iron stack frames (Garrett's patent) for the last twenty years, without any rats. The fact is, they cannot do without water, so if one gets into the stack he must come down to drink, and cannot re-ascend. It is too common a practice to leave carts, ladders, or anything close to the stacks; thus affording access. As soon as these are removed, Mr. Rat must come down for water, and cannot return. We always trim or shave our stacks (cost 1*s.* per stack) to cut off access from below, as well as for economy of corn and neatness.

Mice are more difficult to expel than rats, for they get into the sheaves at harvest time, and are thus carried on to the stack. Unless poisoned by liquid immediately after putting up the stack, they soon find out that they can exist by the 12 per cent. of water contained in straw and 11 per cent. in the grain. They also learn to avail themselves of dew and rain. In the spring and summer they will so multiply as to destroy or damage a large quantity of the grain, especially if left over-year. To show how animals can exist by the water contained in what is called dry grain and its straw, I will relate the case of a horse at Cressing Temple, a few *miles* from me, where a horse used for treading or consolidating the barley in the barn, being left there all night, *slipped down* between the closely packed barley and the

boarded sides of the barn. In vain was search made for him in the morning, and it was concluded that he had been stolen. On Christmas-day, as the ploughmen came to attend to their horses, they heard the neighing of a horse in the barn, and after removing the barley, they found the lost horse as fat and as sleek as a mole. Thinking he must be very thirsty, they ignorantly allowed him to go to the pond and drink his fill, and in consequence he died. This is well known to many persons now living. The horse had gradually eaten his way into a comfortable space. But to return to our rats. They are most industrious and destructive burrowers: as they cannot destroy a solid brick wall, they will burrow under it, unless the foundation is well concreted. Where beams enter the wall, they will gnaw the wood. It requires a watchful eye to keep them under. Every hole should be noted, and plugged at once with a piece of tile or brick fixed with cement, or a piece of hard wood dipped in gas tar. Their runs should be tarred, and thus they will soon get disgusted with their quarters. Wherever a small heap of earth is thrown up near a wall, the run should be traced and at once stopped; lime and stones as a concrete conquer them. Loose lime they cannot work in, it blinds and disgusts them. In every barn and shed door there should be a round hole, about 8 inches in diameter, so that the cats can have free access in search of the rats. It is at night they work, and they do so as much as possible under cover. They may be easily poisoned by strychnine, mixed with ground barley or oats; but before trying this they must be fed for several nights with the meal unmixed with poison. Rats are very sagacious, and had I space I could relate many instances of their cunning. It is a most dangerous thing to spread poison on bread and butter, for they carry it away; and I know of too many instances where valuable dogs, fowls, &c., have perished. Another inconvenience is that when poisoned they die in their burrows, which are too frequently under your drawing or dining room, or in the walls. Their decomposition causes a most detestable and too durable stench. There is nothing like plenty of cats. I find male cats castrated when young by far the best rat-catchers, and by blocking the holes you give the cats a better chance of catching them. Traps may also be set, but they are very wary of them. Hollow walls are objectionable, so is thatch on buildings.

Water-rats undermined the banks of my pond until I *turned in a few* pike, which soon converted rats into fish. A

pike of 3 lb. will take a rat and swallow him at once. Beware of pike where you have young ducks, for they enjoy them quite as much as they do rats. I had imagined that there was a chance of the rat biting the stomach of Mr. Pike; but, as an old angler, and examining the condition of the pike's stomach with a bait in it, I found that there is no fear of that, for instantly the stomach collapses like an elastic pitch-plaster, and not a single breath could the rat or any living thing draw. Pike always swallow their prey alive and head foremost. They are very fond of eels, and swallow them alive and head foremost. They always seize their prey across the middle, and, unless very hungry, hold them so for some time.

Rats find abundant accommodation and concealment under the old-fashioned wooden barn floors and dilapidated or thatched farm buildings. The modern system of asphalting upon concrete is an effectual barrier, they cannot gnaw it; their only chance is to burrow under between the ground and the concrete, and this, by a careful examination, may be easily prevented. A very destructive cunning old rat, that could never be trapped, was taken as follows:—Every hole except one was carefully stopped with gas-tar substances, and the trap set at the remaining hole. For two days and nights he declined coming out; but hunger and thirst at last compelled him to face the traps, and he was taken.

I very much commend asphalted floors to my agricultural brethren. It is so cheap and clean, and, above all, prevents any damage to corn, &c., by preventing damp arising from the earth beneath it. Cats such as I have will not only kill rats, but also weazels. The latter will destroy a brood of poultry in a night, if they have access to them. Of course every one knows the value of ferrets and a good rat-dog.—*May*, 1867.

THE LABOURER'S COTTAGE.

If built of 4½ or 9-inch brickwork, it will be very hot in summer and damp in winter. The clay with which our Essex bricks are made is, when baked, very porous and absorbent. This remark applies to many other counties, but not to all, for I have seen, in Staffordshire and elsewhere, pipes and bricks so dense as to be nearly impervious to *water*. *But into* porous bricks the winter rains will enter, *and the moisture* naturally draws towards the warm room.

I have found that lime-wash well worked into the surface of the bricks closes the pores, and thus keeps the house dry. It requires doing annually; the cost is trifling. In summer it has the effect of reflecting the sun's rays instead of absorbing them, and thus keeps the house cool. I have before mentioned that lime-washing slated roofs keeps the house cool. A whitened slate in the hottest summer's day feels cool, the heat being reflected, but one can hardly bear one's hand upon a non-whitened slate. I wonder this is not more often availed of in our towns, where attics as sleeping-rooms are almost unbearable in the summer heat. All cattle-sheds should be so treated. It is a curious fact that heavy rains will not detach or wash off the lime, but the winter's frosts remove it from the slates, not from the bricks. Where vegetation has begun to establish itself on slated and tiled roofs, lime-washing with hot lime destroys it. Frosts remove the lime, and old-looking roofs then look quite new and fresh. The interior of cattle-sheds and stables should be lime-washed at least once a year, on the score of health. The land on which the labourer's cottage stands should be always well drained, at least 4 feet deep, with pipes, covered with loose stones. This prevents the moisture of the ground rising up into the walls by capillarity. Capillarity is overcome thus by gravity. Lime-washing brickwork before painting saves much paint.—*May*, 1867.

BIRDS' NESTS IN CHIMNEYS.

We were once a good deal puzzled by a smoking chimney that had never smoked before, and was perfectly clean. On opening the trap at the angle or turn, we found half a bushel of birds'-nest materials, completely filling the chimney; what surprised us was that it occurred at least 12 feet from the top, so that the birds must have descended in the chimney. I believe that they were starlings. Swallows also build in chimneys occasionally, and sparrows in gutters; so that one has to take note of such matters, or suffer discomfort. It is desirable to examine the flues before winter.—*May*, 1867.

CATTLE PLAGUE.

In the spring of 1866, my neighbours within one or two miles lost their stock by purchasing calves for sucking. At that time I had seventy head of cattle (young and old); they were all, as usual, confined in sheds or boxes, and I am thankful to say that they all escaped the disease. The sheds were well ventilated and lime-washed, and some loose lime laid in various places. No new cattle were purchased.

A DRAINAGE RETROSPECT.

Time tests many things. It is now more tha ntwenty-four years since my draining was completed on every acre of the farm (170 acres); and, as I walk over every field and examine every drain, I ask myself, Has this been a profitable operation, and have those twenty-four years of observation given me additional draining knowledge? It will be satisfactory to drainers to know that not a single drain is choked, but in spite of twenty-four years' use every one is in thorough working order, and all are now discharging freely.

It will be remembered that about sixty acres of my heavy clay were drained in a peculiar manner with small stones and a 2-inch pipe over them, to prevent the earth pressing in among the stones. My good friend Mr. Morton objected to the pipes being so placed, and I, after seeing Mr. Parkes's 4-feet pipe drainage, stated in my book that I thought I had done wrong, and subsequently in some new drainage I adopted the deep-pipe principle, as less costly and more effective. Twenty-four years have elapsed, and I am bound to say that that pipe-and-stone drainage has been most effective, the furrow corn coming to ripeness equally with the rest, which is a certain test of perfect draining.

My men also find that the land works earlier and more friably in the spring than in the deeper and wider drainage. The drains were placed only 12 feet apart, and 2 feet 8 inches deep, filled with stones and pipes, and cost £10 per acre. *But, although* this has been very satisfactory, I should not *do it so again,* but should adopt the deep-pipe drainage at *close intervals.* A good deal depends upon climate and rain-

fall; where the climate is late, stones added to the pipes, and close drainage, will very much forward the crop.

I drained forty-five acres of very heavy land (which I rent), with 1-inch pipes, at the following depths, distances, and cost:—

CHAPEL LAND, 45 ACRES, DRAINED IN 1846.

9 acres, 42 feet apart, 5 feet deep, with 1-inch pipes:—

64 rods of cutting at 6d.	£1	12	0
1,100 ,, 1-inch pipes, at 12s. per thousand (144 allowed for breakage)	0	14	6
Cartage of pipes	0	3	0
Per acre ..	£2	9	6

13-acre field same as above.

11-acre field, at 28 feet apart .. .. Per acre ..	£3	2	6
7-acre field, drained 50 feet apart, and 5 feet deep, as above .. .. Per acre ..	£2	0	0

Wages were then much lower than now.

If thought desirable, it would be easy to cut a drain between each of the others.

These have been done more than twenty years, and, although so cheaply done, they have been sufficiently effective to remove stagnant water and to permit of excellent crops; for I have several times had 7 quarters of wheat, 7 quarters of beans, and 11 quarters of black oats per acre, besides large crops of mangel, clover, and tares.

The land does not work so well in early spring as my own land, nor does the land walk so dry; but still the water flows to the drains and leaves the land, although not so quickly as the close-drained. I can therefore confidently recommend tenant farmers, who desire to economize their capital, to adopt that system as an advantageous one under the circumstances. There will thus be no just excuse for non-drainage.

In very humid climates, with a heavy rain and low temperature, I must candidly admit that I believe the late Lord Wharncliffe's system of close and shallow drains, combined with deep 4 or 5 feet leaders at reasonable distances (say 50 feet), would be most effective drainage under the circumstances.

The shallow drains, not less than 3 feet, in tenacious soils permit a more ready escape of the water when you have *successional* rains at short intervals; the deeper ones drain

the whole area in time, but are longer about it. For instance, as I have witnessed on a field of my own, in a very wet winter I have seen both deep and shallow drains discharging abundantly, like two taps in a full cask, one above the other: the upper drain stops running first, the lower one some time after, and, of course, the lowest drain lowers the level of the water in the soil to its own depth or level; and, therefore, deep drains should always be present, although shallow feeders may come into request for frequent or continuous rain-falls. Water will always pass a shallow drain and descend to a deep one, until it accumulates in the soil and thus rises to or above the level of the shallow drain, and then both shallow and deep drain will run, the shallow one conducting water to the leader much quicker than it can filter through the soil. The great object of drains is to prevent delay or stagnation near the surface in winter, and thus prevent rotting of the winter roots of wheat, tares, and clovers.

After a dry summer the rains will naturally pass down to the deepest drains and flow away. It is only after the ground becomes super-saturated that the shallow drains are called upon to act. All the foregoing remarks apply to tenacious birdlime-like clays, through which, when thoroughly soaked, water filtrates very slowly. On friable soils it would be absurd to have either shallow or close drains. On my mixed soil my drains are more than 4 feet deep, and 60 feet apart. All these remarks apply to surface water.

In dealing with waters rising from below, drains should never be shallower than 4 feet—5 feet is the better depth; with shallow drains capillarity would overcome gravity, and so render the drains useless. There are certain soils where the gridiron or uniform principle would be a partial failure, and it is always desirable to lay drains in the old water-way. Where there are sand-pots surrounded by walls of clay, it is necessary to cut through those walls; where a mixed spring or sandy soil meets a stiff clay (as in some of my fields), great care is required in laying the pipes at the junction, surrounding them with a little hay, especially if the spring is weak and occasional; and even so, the sand, owing to the drain being occasionally dry, will accumulate and harden in the pipes, which must be taken up and cleared. There is no such danger with a constantly and full-running spring. I have three very strong spring-drains discharging from ten to *twenty-five* gallons per minute winter and summer. For *twenty-five years* one has never choked, and they all discharge *white* sand abundantly, especially during winter;

therefore, take especial care to have a clear outlet, whence the sand can be frequently removed, so that it never rises above the drain. One of my spring-drains was originally 12 feet deep, the other two 6 feet; these latter have always been perfect, except where they come into shallow ground near the outlet. In one case some singular roots, like small brown cabbage-leaves, choked it; the other, passing through a neighbour's hedge, filled at that point with roots from the fence, and his field being lower than mine, soon became a quagmire.

A very watchful eye is required for all drains, more especially spring-drains, for if not immediately attended to, the sand, &c., has time to settle in the pipes, and thus choke them for a very long distance, and you are put to a great cost. It is useless to put spring-drains anywhere near trees or fences; if they must pass through the latter, the outlet pipes should be of iron for many yards. It is a remarkable instance of the instinct of plants and trees, that they will surely introduce their roots into constantly running drains—the most minute crevice will suffice—and then the roots multiply and expand until they choke the drains, frequently in masses as thick as one's wrist or arm, and some yards long. But they take care never to enter a drain which is alternately wet and dry for the passage of surface or rain water. Thistles, mangels, &c., will choke a spring-drain if near the surface.

Experience has taught me to avoid open ditches as outlets for single drains. I am letting my drains into leaders placed a foot deeper than the drains, but connected with them by stones, &c.

Open ditches get dry in summer, and the capillarity of the dry sides heads back water in the soil; besides, one outlet well exposed to view is far less likely to be neglected or overlooked than a number of them surrounded by or buried in grass or other vegetation. Besides, we save land by abolishing open ditches.

On putting in these leaders I observe that the land, to the depth of the drains, has become more friable, but the extra spit that we take out below the drain is like putty or birdlime, and most adhesive.

It is thus quite clear that depth of drainage, even in the very stiffest soils, is most important. Every additional foot places 1,200 tons per acre of porous earth for the use of the *roots of plants*; and I know that wheat and most plants will *send down* their roots 4 to 5 feet deep where the land is

drained. All open ditches, as well as drains, require close supervision in *dry* weather: bunches of rushes, bushes, and other obstructions, should then be removed. It is too late when the flood comes, and your land gets carried away by obstructed torrents.

I know of so much neglect in this matter of clear drainage-way that it should be strictly enforced in leases.

When we have heavy rains, I sally forth, in macintosh and water-boots, and see to these matters myself, having especial regard to clear troughing round the buildings, and generally clear water-ways. The projecting "cores" in ditches should be removed in dry weather.

Beware whom you trust to place your draining-pipes, or see to it yourself. A careless unprincipled fellow will put them in anyhow to save himself trouble, and thus ruin your drainage. The loss occasioned this very wet spring by non-drainage is indeed serious. It far exceeds the largest per-centage that could be charged for draining.—*May*, 1867.

The following letter from Mr. Bailey Denton—acknowledged to be one of our very best authorities on drainage—is instructive and convincing:—

WOODFIELD, STEVENAGE, *June* 3, 1867.

MY DEAR MECHI,—I have read with much interest your letter, and those of other correspondents in the *Times*, as to the present condition of the crops; and if it be at all possible to judge by appearances at this season, we may fairly conclude that the advantage in favour of drained heavy lands compared with the same character of undrained lands, will quite equal *half the cost* of draining them.

Having taken some pains to examine into facts (as far as one can form judgment *now*), I write you these lines, that you may, if occasion arise, refer to them with some security.

Going back as far as five years, I find the *average cost* of parallel drainage, varying from 24 feet to 42 feet apart, has been £6. 5*s*. 6*d*. an acre. I am speaking of the works of the General Land Drainage Company, from 1862 to 1866 inclusive. The average charge of the Company to repay the principal (*i. e.* the £6. 5*s*. 6*d*., which includes all expenses), with interest, in thirty-one years, has been £6. 1*s*. per cent., or about 7*s*. 6*d*. per acre.

Now, the difference in the crops of this year—taking the most moderate view of the matter—cannot be less in favour of the drained lands than

1 quarter in wheat	=	£3	7	6
3 coombs in beans	=	3	3	0
1 quarter in oats	=	1	7	0
1 quarter in barley	=	2	0	0;

with seeds and tares to match, saying nothing as to roots, which we shall know better of presently.

The half of the average cost of draining being £3. 2*s*. 9*d*., you will see, by comparing the figures I have quoted, that the increase in the wheat and *beans, which absorb* the larger part of the cropping of the heavy lands, quite *equals this moiety*, let alone the difference in the cost of tillage, which has *been very great.*

If we turn from this comparison to the fact that the cost of draining is repaid

by 7s. 6d. per acre, it is indeed difficult to understand how occupiers can withstand the advantage of having their wet lands drained with borrowed capital. But it is true that many would rather lose their crops than pay this small annual charge, because they cannot bear the thought of *their rents being raised* (as they call it), and of submitting to the obligation of maintaining outfalls and outlets under the "orders of Government."

All those who are obliged to grow barley on heavy land, if they grow it at all, will do well to study the different condition of their fields. Wherever the land has been mauled by sheep or plough, they may wish in vain for a crop.

Yours faithfully,

J. BAILEY DENTON.

We should have the difference in the oat and barley crop at $1\frac{1}{2}$ to $2\frac{1}{2}$ quarters per acre.—*June*, 1867.

DUNG-HEAPS

Are, in my opinion, breeding-places for the insect tribe; not so shed manure, constantly trampled upon by cattle,—it is far too pungent for any living thing to exist or breed in it. —*May*, 1867.

ADVERTISING.

IT is a singular fact, that one rarely sees a farmer's advertisement of what he has to sell and what he wants to buy. The result is that he must either employ commission agents (called dealers), or sell his own stock at the neighbouring market. Many dealers are very conscientious men, but I have known some cases where 30 to 40 per cent. profit has intervened between the seller and buyer. Besides, a single market is a limited one both for buyer and seller; animals are often worn down by travel, from market to market, and too frequently contract and bring home diseases.

Advertisements were once dear and heavily taxed, now they are cheap, and would be cheaper still were the farming advertisements more numerous. A newspaper reaches a whole county, and probably beyond that. I find it by far the most ready way of obtaining what stock I require, and at a moderate price—especially during the prohibition of cattle-markets caused by the cattle plague.—*May*, 1867.

MY STEAM-ENGINE.

After twenty years of heavy wear, I still find it as efficient as on its first purchase, and likely to last for many years to come. Last year I fitted it with a new Cornish boiler, preferring perfect safety, especially as we work at a pressure of 70 lb. per inch. The old boiler was allowed for in exchange, and would still do a great deal of work at 40 lb. per inch, the water in it having always been kept at a proper level: for two years it was worked at 120 lb. per inch. I also fitted shakers instead of rakes to my old threshing-machine, and put all the machinery, engine, pumps, &c., into thorough repair,—the cost of this was £150. The new boiler is 12 feet long and 4 feet 6 inches in diameter; the furnace is within the flue; so that all the radiating heat is applied to the boiler. There is thus no brickwork immediately in connection with the furnace, but merely for the flue.

We have always an abundance of steam for every purpose without much stoking, and use the dust coal, which only costs us 10*s.* 6*d.* per ton, and 3*s.* per ton cartage from Maldon. It is the screenings from the best coal, and practically we can keep up more steam with this than with the large coal, because, being in such minute pieces, it is quickly converted into flame when spread over the surface of the fire.

During the six winter months our engine has daily work in threshing, grinding, pumping, chaff-cutting, cake-breaking, working Bentall's pulper and Gardener's cutter, pumping water, irrigating, and steaming for our cattle, which vary from fifty to seventy head, young and old, besides 200 sheep. It also raises all the sacks of corn to the upper floors. It earns a considerable sum annually by grinding for my neighbours, when wind or water mills are at a standstill for want of wind or water. Our engine (fixed) is nominally of 6-horse power, but with an 8-horse boiler, and 70 lb. of steam, no sixteen horses could do its work; and they would have been worn out. Its consumption of dust coal is from 8 to 12 cwt. per day, according to the severity of the work, at a cost of about 6*s.* to 8*s.* 6*d.* per day.

We sometimes ask ourselves how it is possible for a farmer *of 170 acres* (having a regard to profit) to do without an *engine, especially* where much stock is kept. I paid £150

for the engine and boiler twenty years ago,—of course all the machines connected with and worked by it were an additional cost.

When barley was 20*s.* per quarter, our millstones (4 feet 2 inches in diameter) ground 1,500 quarters in one year for our pigs. Barley is too dear now for pig-feeding.

One of our agricultural labourers has driven the engine for twenty years. One can generally find among one's men a handy labourer with mechanical tendencies; the engine soon teaches him to be a handy man, who will learn to dress the millstones, keep the machinery in repair, and do a number of mechanical jobs, such as rough-painting, carpentering, smith's work, and even a little slating and bricklaying.

It certainly does astonish me that so many large farmers, with means, are without suitable steam machinery. I quite agree with the reporters on steam cultivation, in the latest number of the Society's journal, that the farmer should himself know something about the steam-engine to use it with comfort and profit.—*May*, 1867.

THE DIFFERENCE BETWEEN PLOUGHING AND CULTIVATION.

DEEP ploughing may be ruinous where deep cultivation would be beneficial. This apparent paradox may be easily explained:—Where the land, just below the regular ploughed line, is undrained, panned down, and consequently has never been subjected to the ameliorating influence of aëration by exposure, it is, in too many instances, absolutely poisonous to young plants. I know of some cases where, by at once ploughing up and bringing to the surface four or five inches of raw sub-soil, the land has been rendered much less productive for several years, that I warn my amateur farming friends against committing such a costly error. The young growing plants cannot thrive, in the beginning of their growth, in such unprepared mass, and, consequently, are enfeebled before their roots reach the good buried top soil.

That able agriculturist, the late Mr. Smith, of Deanston, wisely recommended that the sub-soil should be allowed to dry a little after being drained before even sub-soiling was attempted; and that kind and enlightened man, the Rev. Sam. Smith, of Lois Weeden, ploughed his top soil together *and then worked* his manure into the uncovered sub-soil,

leaving it bare for a time and then re-covering it with the surface soil.

When I deeply cultivate I plough the top soil and follow in the same track with another plough (minus its breast or mould-board); the next turn of the first plough then covers up this raw sub soil. In this operation a portion of the sub-soil gets gradually mixed with the surface soil, and thus my staple is gradually increased with benefit to the crops.

My experience teaches me that from ten to twenty years will hardly suffice to bring into a suitable condition some of our tenacious plastic clay sub-soils. It is on these grounds that I should, in the case of using steam power, commend the use of the grubbers, or cultivators, that stir the soil deeply without bringing much of it to the surface, and that it should be a gradual deepening instead of tearing up at once great masses of the sub-soil.

I have neverseen any implement so suited to the purpose as that which steam-ploughed a portion of my clover in 1856, in the presence of a large company. That deep cultivation showed its good effect for several years. Fowler's plough was supplemented by Cotgreave's sub-soil plough. They were attached, so that, as they moved along, one furrow-slice lay under the other, the top soil being laid on the top of the other; and yet, strange to say, I never have seen this used since. The fact is that this double ploughing takes much power and cannot be hurried over, but it is the proper and most profitable mode.

Many farmers have been ruined by rashly burying their best soil, and covering it with several inches of raw sub-soil. There may be some sub-soils sufficiently wholesome to permit of their being suddenly brought to the surface. In many cases ploughing is objectionable, leaving long unfilled spaces unacceptable to the roots of plants. The cultivator has many advantages.—*June*, 1867.

WORKING OUT A FARM.

THERE are certain persons always on the look-out for a farm that has been highly cultivated and in first-rate condition, with the intent of working it out, very much to the *ultimate injury* of the landlords. Such persons are generally *very bad farmers*. They will, probably, offer a higher rent *than a known good* farmer could afford to give; but, at the

end of the term, the land will be in such a foul and exhausted condition that the apparent gain in rent will have been more than lost to the landlord, as he will find when he attempts to re-let it.

AGRICULTURAL SAYINGS.

"Saturday's moon,
And Sunday full,
Never was good,
And never wull,"

is as old an adage as the hills (in Suffolk).

It appears by the foregoing that a Sunday full moon is as likely to be a wet one as a Saturday new moon.

"As May leaves the crops, so harvest finds them," is another accepted belief.—*June*, 1867.

ARTIFICIAL CONDITION OF LIVE STOCK.

The necessity for producing a much larger quantity of meat and manure per acre, obliges us to obtain early development and maturity by rich and varied food, combined with suitable shelter and temperature. Fat mutton at one year old and beef at two years is the order of the day. This cannot be obtained by the natural and ordinary system of out-of-door field-feeding, unaided by rich supplemental food and warm quarters. Therefore, from the very beginning of its growth, the animal should be highly fed and well cared for.

If we buy in lean stock, and attempt to force them by a too sudden change to rich food, disease and death will most likely follow; and I am more and more convinced that this is one of the main causes of pleuro-pneumonia in cattle. The too sudden increase in the richness and quantity of blood causes irritation and inflammation in the small and contracted blood-vessels; then suppuration follows.

In covered yards or boxes, beware of using long unbroken straw too liberally. You will get fermentation and disease. The straw must be short and broken, either by the chaff-cutter or otherwise. When the bedding is in a hodge-podge *condition, without* heat, health is safe.—June, 1867.

SPRATS *v.* GUANO.

THE necessity for comparative experiments is well illustrated in this case. Several acres of barley were manured with 30 bushels of sprats, at a cost of 9*d.* per bushel and cartage. One acre was dressed with Peruvian guano and salt at the same cost. Judging from present appearances, there will be at least one quarter more barley on the spratted land. The soil is drained, light soil, intermixed with various other kinds of soil. The barley is higher, thicker, and altogether visibly superior to the guanoed portion, although they were both drilled and manured at the same time. On a heavy land seven-acre field, the same comparative trial has been made with black oats. Although the difference is by no means so striking, the balance of advantage appears to be in favour of the guanoed portion.

I drill 6 pecks of barley and 8 pecks of oats per acre.

The appearance of the crops, especially the barley, convinces me how wrong it would have been to have put in 3 or 4 bushels of barley and 5 or 6 of oats, which is too frequently done. This season such sowing on good or highly-farmed lands will cause a too early laying of the crop, and a very heavy loss.

Sprats are much the best before spawning, which takes place at Christmas, or soon after; they then are only worth 7*d.* a bushel (about 56 lb. weight), as they contain so many drops less of oil.

I shall try the same comparative experiments with "five-fingers," as they are called, better known as star-fish. These star-fish are very destructive to oysters. I am also comparing sprats with guano for mangel.—*June*, 1867.

ADVICE TO BUTCHERS.

HOT summer weather, especially if accompanied by thunder-storms, causes heavy losses to butchers. If the meat cannot be got cool and stiff after slaughtering, it soon becomes unacceptable to the consumer. A block of Wenham Lake ice, worth a few shillings, may save many times its *cost.* When I gave my great agricultural gatherings, there *was cooking* going on for some days previously. The end of *July was a* time for flies and rapid decomposition. I

always, however, succeeded in keeping everything sweet and wholesome. A block of ice weighing 60 to 100 lb. was placed in the larder. The caloric of the atmosphere was employed and absorbed in melting it; the consequence was a low temperature, in which flies cared not to enter. The block of ice disappeared gradually, and if necessary was replaced by another.

There were several advantages in this proceeding. The fibre of meat got nicely broken down, rendering it tender, while perfectly free from taint.

Every alderman knows that buck venison is in high season in the hottest part of July. Nine times out of ten venison is then spoiled by taint; the very smell of it is disagreeable. A noble duke once sent me half a buck in July. By the plan I recommend, it was kept sweet and wholesome for nearly three weeks. Every one praised it, and the fat was like marrow.

I am induced to make this suggestion because some of the best portions of a fine fat bullock purchased of me were spoiled for want of a little cool air.

Blocks of ice travel cheaply by rail (goods train) packed in sawdust and old sacking.

If meat cannot be got cool enough to become *stiff* before packing, sending it in that soft state to a market is a ruinous affair. The same remark holds good for meat that is to be salted.

A number of my pigs, when ready, were divided; one-half I sold to a neighbouring butcher; and the other half, slaughtered at home, and placed in my larder, got cool and stiff: not so the others. My pigs realized in London 12*s.* per head, or 30 per cent. more than those soft, flabby ones sent up by the butcher, who thus suffered a heavy loss.

I am informed that the Messrs. Harris, of Calne, in Wiltshire (who slaughter 500 fat hogs weekly, weighing from 200 lb. each upwards), import a cargo of ice from Norway, in order to get their meat properly cooled in hot weather, before they salt and convert it into bacon.—J. Mechi, *June*, 1867.

CLOVER FED OFF, OR TWICE MOWED?

I am so often told "I get better wheat after clover twice mowed for hay than after clover fed off all the season," that *I was induced* to search for an explanation of this apparent

paradox, and it appears to me to be as follows:—Animals, especially sheep, when turned into clover early, take the first little shoots made by the plant and continue to do so; thus preventing the full growth of leaf, without which there can be little root or stem development. If we pinch off the youngest shoots of a plant in a flower-pot, and continue to do so as fresh ones appear, the consequence must be very obvious. On the full development of clover-root formation depends the future wheat crop. My practice is to mow the first growth of clover for hay, then spread manure over the surface, and as soon as the plants are fully developed, sheep are folded upon it, eating cake and corn after this. I can safely take two good crops of wheat, the second crop being pithy Rivelts. If clovers were permitted to be well-grown before being fed, the difference of opinion mentioned would cease to exist.—*June*, 1867.

AGRICULTURAL GRENADIERS AND RIFLEMEN.

WHENEVER I see the crops of grain on undrained and ill-cultivated or over-seeded fields, the irregular height of the stems reminds me of an incongruous admixture of stalwart bearskins and tiny riflemen. This is a sure indication of imperfect farming. We see in the furrows plants with short stems, small ears, and an uncomfortable greenish-brown colour. On well-drained and well-cultivated lands the crops about this time (10th to 20th June), present an even appearance, and when the ears are protruded, one may almost lay a rule across them, and they are regular in ample development.

I am sorry to be obliged to say that the admixture I have described is far too general and prevalent for the welfare of the country.—*June*, 1867.

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